Vol. 11, No. 13
July 15, 1986

Energy Research Abstracts

Abstracts 29152-31294

Office of Scientific & Technical Information
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Office of Scientific and Technical Information; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Office of Scientific and Technical Information, U. S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37831. Telephone (615) 576-1301; FTS 626-1301.

PUBLICATIONS OF THE OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize legislative, regulatory, and other legal aspects, as well as social, economic, and environmental impacts. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The annual subscription price is $72.00 for domestic (North America) or $90.00 for foreign (outside North America) subscribers; a single issue is $5.00 or $6.25, respectively.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The annual subscription price for the 24 issues is $146.00 for domestic (North America) subscribers or $182.50 for foreign (outside North America) subscribers. A single issue is $14.00 or $17.50, respectively.

DOE Patents Available for Licensing (PAL)

DOE is prepared to grant exclusive or nonexclusive, revocable licenses under DOE-owned U. S. patents and patent applications; this semiannual publication provides abstracting and indexing coverage of this literature. *PAL* is available (use PB86-946800) from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The annual price is $18.00 for domestic (North America) or $36.00 for foreign (outside North America); a single issue is $9.00 or $18.00, respectively.

Energy Meetings (EM)

A monthly listing of conferences, symposia, workshops, etc., pertaining to DOE's programmatic interests. *EM* is available on subscription (use PB86-901500) from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The annual subscription price is $45.00 for domestic subscribers and $90.00 for subscribers outside the North American continent; a single issue is $5.00 and $10.00, respectively.

The following monthly update journals are available to the public on subscription from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161; use the identifying order number (PB- No.) when subscribing. The annual subscription price (12 issues plus cumulative index) is $85.00 for domestic (North America) and $170.00 for foreign (outside North America) subscribers; a single issue is $8.00 and $16.00, respectively.

Current Energy Patents (CEP)–**PB86-902800.** International patent literature, including patent applications, on any aspect of energy production, conservation, and utilization.

Energy and the Environment (EAE)–**PB86-914900.** Impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment.

Fossil Energy Update (FEU)–**PB86-914600.** The exploration, development, processing, and use of fossil fuels.

Fusion Energy Update (CFU)–**PB86-915300.** Information on controlled thermonuclear fusion, including plasma and fuel research and power plant engineering and conceptual design studies.

Solar Energy Update (SEU)–**PB86-914500.** The utilization of solar energy, including biomass and tidal and wind power.

The following semimonthly bulletins are also available from the National Technical Information Service. The annual subscription rate for one volume (calendar) year (24 issues; no indexes) is $45.00 for domestic (North America) and $90.00 for foreign (outside North America) subscribers; use the identifying order number (PB- No.) when subscribing.

Acid Precipitation (APC)–**PB86-901000.** Acid precipitation, including effects and possible control measures.

Buildings Energy Conservation (BEC)–**PB86-900700.** Technology required for energy conservation in buildings of all types.

Coal-Based Synfuels (CBS)–**PB86-901400.** Conversion of coal into gaseous or liquid fuels.

Coal Combustion and Utilization (CCU)–**PB86-914400.** Coal combustion, including fluidized bed combustion, and direct utilization of coal for power generation, fuel cells, and MHD generators.

Coal Preparation and Pollution Control (CPC)–**PB86-900800.** Coal preparation and cleaning and reducing pollution from its direct combustion.

Direct Energy Conversion (DEC)–**PB86-946600.** Photovoltaics, magnetohydrodynamics, electrohydrodynamics, thermoelectrics, thermionics, and fuel cells.

Energy from Biomass (EFB)–**PB86-900600.** Biomass production, conversion, and utilization for energy.

Geothermal Energy Technology (GET)–**PB86-914700.** Exploration, development, and utilization of geothermal resources.

Heavy-Ion Reactions (HIR)–**PB86-900500.** Heavy-ion (A > 4) reactions.

Laser Research (LAR)–**PB86-901100.** Laser research and development, excluding applications.

Nuclear Fuel Cycle (NFC)–**PB86-913400.** Both front and back ends of the nuclear fuel cycle.

Nuclear Reactor Safety (NRS)–**PB86-913500.** Accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures.

Radioactive Waste Management (RWM)–**PB86-902900.** Management aspects of transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers.

Solar Thermal Energy Technology (STT)–**PB86-901200.** Research and development of efficient and reliable solar thermal conversion systems.

Transportation Energy Research (TER)–**PB86-900900.** Energy-efficient advanced automotive propulsion systems and transportation energy conservation.

Unconventional Petroleum (UCP)–**PB86-901300.** Secondary and tertiary recovery of petroleum and oil shales and tar sands.

INTERNATIONAL ENERGY PUBLICATIONS

The Office of Scientific and Technical Information (OSTI) cooperates in the publication of international abstract journals with the following: (1) International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria, for *Atomindex;* (2) International Energy Agency, Biomass Conversion Technical Information Service, Dublin, Ireland, for *Biomass Abstracts;* and (3) International Energy Agency, IEA Coal Research, London, England, for *Coal Abstracts.* In each case, the cognizant foreign agency provides the non-U. S. information to OSTI for inclusion in the Energy Data Base; in turn, OSTI provides the U. S. information for input into the respective journal.

Atomindex

A semimonthly abstract journal providing worldwide coverage of information on nuclear science and technology. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Biomass Abstracts

A bimonthly abstract journal with comprehensive coverage of information on the conversion of biomass to energy. *Biomass Abstracts* is available free to DOE components and contractors from OSTI. Non-DOE organizations may obtain *Biomass Abstracts* from Biomass Conversion Technical Information Service, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland, for 42 IR pounds per year. Make checks payable to the Institute.

Coal Abstracts

A monthly abstract journal providing comprehensive worldwide coverage of information in the field of coal science and technology. *Coal Abstracts* is available to DOE components and contractors from OSTI. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

International Copyright, © U. S. Department of Energy, 1986, under the provisions of the Universal Copyright Convention, United States copyright is not asserted under the United States Copyright Law, Title 17, United States Code.

energinfo ERA

Vol. 11, No. 13
ISSN: 0160-3604
CODEN: ERABD
July 15, 1986

ENERGY RESEARCH ABSTRACTS

ABOUT THE OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION

The Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, OSTI places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory, energy analysis, and policy-related areas. To accomplish this mission, OSTI builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to OSTI's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of OSTI's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Office of Scientific and Technical Information has developed and maintains systems to record and communicate energy-related research-in-progress information, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications; OSTI also serves as adviser for special publication needs of the Department. To effectively manage DOE's technical information resources, OSTI's program is one of continual development and evaluation of new information products, systems, and technologies.

UNITED STATES DEPARTMENT OF ENERGY

John S. Herrington
Secretary

Martha O. Hesse
Assistant Secretary
Management and Administration

Harry L. Peebles
Director of Administration

Joseph G. Coyne
Manager
Office of Scientific and Technical Information

ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

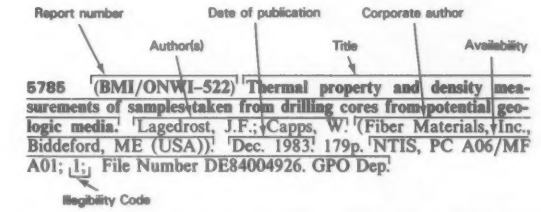
ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $146.00 for domestic subscribers and $182.50 for foreign subscribers. A single issue costs $14.00 (domestic) or $17.50 (foreign). The cumulative indexes will be available in printed form from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, and in microfiche form from the National Technical Information Service, U. S. Department of Commerce, Springfield, VA 22161, and from Engineered Systems, P. O. Box 866, Oak Ridge, TN 37831.

Office of Scientific and Technical Information
United States Department of Energy, P. O. Box 62, Oak Ridge, TN 37831

HOW TO USE *ENERGY RESEARCH ABSTRACTS*

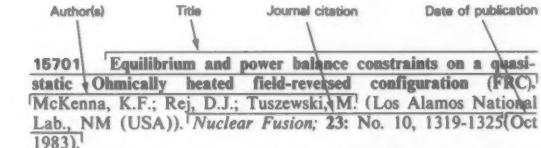
ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.



5785 (BMI/ONWI-522) **Thermal property and density measurements of samples taken from drilling cores from potential geologic media.** Lagedrost, J.F.; Capps, W. (Fiber Materials, Inc., Biddeford, ME (USA)). Dec. 1983. 179p. NTIS, PC A06/MF A01; I; File Number DE84004926. GPO Dep.

Abstract: Density, steady-state conductivity, enthalpy, specific heat, heat capacity, thermal diffusivity and linear thermal expansion were measured on 59 materials from core drill samples of several geologic media, including rock salt, basalt, and other associated rocks from 7 potential sites for nuclear waste isolation. The measurements were conducted from or near to room temperature up to 500°C, or to lower temperatures if limited by specimen cracking or fracturing. Ample documentation establishes the reliability of the property measurement methods and the accuracy of the results.



15701 **Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC).** McKenna, K.F.; Rej, D.J.; Tuszewski, M. (Los Alamos National Lab., NM (USA)). *Nuclear Fusion;* **23:** No. 10, 1319-1325 (Oct 1983).

Abstract: Zero-dimensional power balance calculations are performed for a quasi-static, purely Ohmically heated field-reversed configuration. Without compression, the constraint imposed by radial pressure balance limits the power input. Estimates of the energy loss from impurity line radiation as well as from classical and anomalous transport are given. Effects of cold puff gas injection are also investigated.

INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA).* Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

● Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

5785 (BMI/ONWI-522) **Thermal property and density measurements of samples taken from drilling cores from potential geologic media.** Lagedrost, J.F.; Capps, W. **(Fiber Materials, Inc., Biddeford, ME (USA)).** Dec. 1983. 179p. NTIS File Number DE84004926. GPO Dep.

is indexed as:

Fiber Materials, Inc., Biddeford, ME (USA)

● Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Capps, W., *See* Lagedrost, J. F.
Lagedrost, J.F., Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
McKenna, K.F., Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC), 9:15701 (J;US)
Rej, D.J., *See* McKenna, K.F.
Tuszewski, M., *See* McKenna, K.F.

● Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

SALT DEPOSITS
Density
Thermal property and density measurements of samples taken from drilling cores from potential geologic media, 9:5785 (R;US)
REVERSED-FIELD PINCH
Energy Balance
Equilibrium and power balance constraints on a quasi-static Ohmically heated field-reversed configuration (FRC), 9:15701 (J;AT)

● Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

AC06-76RL01830 **Fiber Materials, Inc., Biddeford, ME (USA)** 9:5785 BMI/ONWI-522

● Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under a File Number, that number is included in the availability statement. A file number–report number correlation is included for convenience.

BMI/ONWI-522 9:5785 NTIS, PC A09/MF A01. File Number DE84004926, Distribution Category MN-70

STAFF OF ENERGY RESEARCH ABSTRACTS

Henry D. Raleigh, Editor

Chemistry, Materials, and Biological Sciences Branch
M. Catherine Grissom, *Chief*

Scientific Analysts
Polly S. Blackburn, *Environmental Sciences*
D. Lamar Cason, *Materials, Physical Chemistry, and Electric Power*
Pamela L. Gorman, *Chemical Engineering*
Lynda H. McLaren, *Nuclear Fuels and Radio- and Radiation Chemistry*
Lorne T. Newman, *Coal*
Axel C. Ringe, *Geosciences and Life Sciences*
Amy T. Tamura, *Fossil Fuels*
Dennis T. Traylor, *Biological Sciences and Biomass*

Nuclear Engineering and Physics Research Branch
Lila Smith, *Chief*

Scientific Analysts
James D. Bales, *Nuclear Engineering*
David C. Cunningham, *Nuclear Engineering*
Wanda R. Ferrell, *Atomic, Molecular, and Fluid Physics*
Douglas Lane, *Nuclear Physics*
Barry C. Steele, *Solar Energy*
Milton O. Whitson, *Fusion Energy*
Larry E. Williams, *High Energy Physics and Engineering*

Lawrence T. Whitehead, *Defense Programs*

Subject Heading Specialist
Mona H. Raridon

Contract Number and Report Number Specialist
Ramona N. Nelson

Computer Processing Coordinator
Billy H. Brady

Corporate Author Specialist
Patsy L. Hendricks

International Exchange Coordinator
Charles E. Stuber

Publishing Coordinator
Janice M. Blanton

Much of the information is provided by (1) bilateral exchange agreements with foreign organizations, and (2) exchange agreements or contracts with other U. S. government agencies, private firms, or institutions.

Foreign Sources

CEA Centre d'Etudes de Saclay
GIF-sur Yvette Cedex, France

Fachinformationszentrum
Energie, Physik, Mathematik GmbH
Karlsruhe, Federal Republic of Germany

IEA Biomass Conversion Service
Dublin, Ireland

IEA Coal Research
Technical Information Service
London, England

International Atomic Energy Agency
International Nuclear Information System
Vienna, Austria

Nordic Energy Libraries
Risoe National Library
Roskilde, Denmark

Research Center
Netherlands Energy Research Foundation
Petten, Holland

United Kingdom of Great Britain and Northern Ireland
Department of Energy
London, England

U. S. Sources

American Institute of Physics
New York, NY

Department of Commerce
National Technical Information Service
Springfield, VA

Jerry M. Thomas and Associates
Oak Ridge, TN

National Aeronautics and Space Administration
Scientific and Technical Information Division
Springfield, VA

National Institutes of Health
National Library of Medicine
Bethesda, MD

NOVA Information Services Company
Commack, NY

Plenum Publishing Corporation
New York, NY

University of Tennessee
Graduate School of Library and Information Sciences
Knoxville, TN

Communication concerning the editorial policy and content of *Energy Research Abstracts* should be addressed to the Editor, *Energy Research Abstracts,* Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 39 first-level and 293 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semi-monthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R6 from NTIS for $9.50.

01 COAL AND COAL PRODUCTS
- 04 Processing
- 05 By-Products
- 06 Properties
- 08 Waste Management
- 09 Environmental Aspects
- 10 Reserves and Exploration
- 20 Mining
- 30 Transport and Handling
- 40 Combustion
- 50 Marketing and Economics
- 60 Health and Safety
- 70 Legislation and Regulations

02 PETROLEUM
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling and Production
- 04 Processing
- 05 Products and By-Products
- 06 Health and Safety
- 07 Marketing and Economics
- 08 Waste Management
- 09 Environmental Aspects
- 10 Legislation and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Storage
- 50 Combustion

03 NATURAL GAS
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling, Production, and Processing
- 04 Products and By-Products
- 05 Health and Safety
- 06 Marketing and Economics
- 07 Waste Management
- 08 Environmental Aspects
- 09 Artificial Stimulation
- 10 Legislation and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Combustion
- 50 Storage

04 OIL SHALES AND TAR SANDS
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 03 Drilling, Fracturing, and Mining
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 06 Direct Uses and By-Products
- 07 Health and Safety
- 08 Marketing and Economics
- 09 Waste Research and Management
- 10 Environmental Aspects
- 20 Regulations

05 NUCLEAR FUELS
- 01 Reserves
- 02 Exploration
- 03 Mining
- 04 Feed Processing
- 05 Enrichment
- 06 By-Products
- 07 Fuels Production and Properties
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 10 Marketing and Economics
- 20 Waste Management
- 30 Environmental Aspects
- 40 Health and Safety
- 50 Regulations

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 01 Physical Isotope Separation
- 02 Radiation Sources
- 03 Isotopic Power Supplies

08 HYDROGEN
- 01 Production
- 02 Storage
- 03 Transport
- 04 Marketing and Economics
- 05 Safety
- 06 Industrial and Commercial Use
- 07 By-Products
- 08 Properties
- 09 Environmental Aspects

09 OTHER SYNTHETIC AND NATURAL FUELS
- 01 Hydrocarbon Fuels
- 02 Alcohol Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 04 Solid Waste and Wood Fuels
- 05 Liquid Waste Fuels
- 06 Gaseous Waste Fuels

13 HYDRO ENERGY
- 01 Resources and Availability
- 02 Site Geology and Meteorology
- 03 Plant Design and Operation
- 04 Regulations and Licensing
- 05 Economics and Management
- 06 Environmental Aspects
- 07 Power-Conversion Systems

14 SOLAR ENERGY
- 01 Resources and Availability
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 05 Solar Energy Conversion
- 06 Photovoltaic Power Systems
- 07 Solar Thermal Power Systems
- 08 Ocean Energy Systems
- 09 Solar Thermal Utilization
- 10 Solar Collectors and Concentrators
- 20 Heat Storage

15 GEOTHERMAL ENERGY
- 01 Resource Status and Assessment
- 02 Geology and Hydrology of Geothermal Systems
- 03 Geothermal Exploration and Exploration Technology
- 04 Legal and Institutional Aspects
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 07 By-Products
- 08 Geothermal Power Plants
- 09 Geothermal Engineering
- 10 Direct Energy Utilization
- 20 Geothermal Data and Theory

16 TIDAL AND WAVE POWER
- 03 Regulations
- 04 Economics

16 TIDAL AND WAVE POWER (CONT.)
- 05 Environmental Aspects
- 07 Tidal Power Plants
- 08 Wave Energy Converters

17 WIND ENERGY
- 01 Availability (Climatology)
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects
- 06 Wind Energy Engineering

20 ELECTRIC POWER ENGINEERING
- 01 Power Plants and Power Generation
- 02 Environmental Control Technology
- 03 Power Transmission and Distribution

21 NUCLEAR POWER PLANTS
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 05 Power Reactors, Breeding
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 07 Regulation and Licensing
- 08 Economics
- 09 Process Heat Reactors

22 NUCLEAR REACTOR TECHNOLOGY
- 01 Theory and Calculation
- 02 Components and Accessories
- 03 Fuel Elements
- 04 Control Systems
- 05 Environmental Aspects
- 06 Research, Test, and Experimental Reactors
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety

25 ENERGY STORAGE
- 01 Magnetic
- 02 Compressed Gas
- 03 Pumped Hydro
- 04 Capacitor Banks
- 05 Flywheels
- 06 Thermal
- 07 Liquefied Gas
- 08 Chemical
- 09 Batteries

29 ENERGY PLANNING AND POLICY
- 01 Energy Analysis and Modeling
- 02 Economics and Sociology
- 03 Environment, Health, and Safety
- 04 Natural Resources
- 05 Research, Development, Demonstration, and Commercialization
- 06 Nuclear Energy
- 07 Transport and Storage
- 08 Waste Heat Utilization
- 10 Conservation
- 20 Supply, Demand, and Forecasting
- 30 Policy, Legislation, and Regulation
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 60 Electric Power
- 80 Consumption and Utilization
- 90 Unconventional Sources and Power Generation

30 DIRECT ENERGY CONVERSION
- 01 MHD Generators
- 02 EHD Generators
- 03 Thermoelectric Generators
- 04 Thermionic Converters
- 05 Fuel Cells
- 08 Miscellaneous Converters

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
- 01 Buildings
- 02 Transportation
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 09 Education and Public Relations

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
- 01 Internal Combustion Engines
- 02 External Combustion Engines
- 03 Electric-Powered Systems
- 04 Hybrid Systems
- 05 Flywheel Propulsion
- 06 Vehicle Design Factors
- 07 Emission Control
- 08 Alternative Fuels

36 MATERIALS
- 01 Metals and Alloys
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 04 Polymers and Plastics
- 06 Other Materials

40 CHEMISTRY
- 01 Analytical and Separations Chemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 04 Electrochemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry
- 08 Combustion Pyrolysis, and High-Temperature Chemistry

42 ENGINEERING
- 01 General Engineering
- 02 Facilities and Equipment
- 03 Lasers
- 04 Heat Transfer and Fluid Flow
- 05 Materials Testing
- 06 Safety Engineering
- 07 Vacuum Engineering
- 08 Electronic Circuits and Devices
- 09 Waste Processing Plants and Equipment
- 10 Combustion Systems
- 20 Underground Engineering
- 30 Marine Engineering
- 40 Pollution Control Equipment
- 50 Power Cycles

43 PARTICLE ACCELERATORS
- 01 Design, Development, and Operation
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 03 Auxiliaries and Components
- 04 Storage Rings

44 INSTRUMENTATION
- 01 Radiation Instrumentation
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 03 Miscellaneous Instruments
- 04 Well Logging Instrumentation

45 EXPLOSIONS AND EXPLOSIVES
- 01 Chemical
- 02 Nuclear
- 03 Explosion Detection

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

52 ENVIRONMENTAL SCIENCES, AQUATIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

53 ENVIRONMENTAL—SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
- 01 Social and Economic Studies
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements

55 BIOMEDICAL SCIENCES, BASIC STUDIES
- 01 Behavioral Biology
- 02 Biochemistry
- 03 Cytology
- 04 Genetics

55 BIOMEDICAL SCIENCES, BASIC STUDIES (CONT.)
05 Metabolism
06 Medicine
07 Microbiology
08 Morphology
09 Pathology
10 Physiological Systems
20 Public Health
30 Agriculture and Food Technology

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
01 Radiation Effects
02 Thermal Effects
03 Chemicals Metabolism and Toxicology
04 Other Environmental Pollutant Effects

57 HEALTH AND SAFETY

58 GEOSCIENCES
01 Geology and Hydrology
02 Geophysics
03 Mineralogy, Petrology, and Rock Mechanics
04 Geochemistry
05 Oceanography

64 PHYSICS I
01 Astrophysics and Cosmology
02 Atmospheric Physics
03 Atomic, Molecular, and Chemical Physics
04 Fluid Physics
50 High Energy Physics

65 PHYSICS II
10 Nuclear Physics
40 Radiation and Shielding Physics
50 Medical Physics
60 Solid-State Physics
61 Superconductivity
70 Theoretical Physics
80 Mathematical Physics
90 Communication, Education, History, and Philosophy

70 FUSION ENERGY
01 Plasma Research
02 Fusion Power Plant Technology

99 GENERAL AND MISCELLANEOUS
01 Management
02 Mathematics and Computers
03 Information Handling
04 Law
05 Civilian Defense

CORPORATE AUTHOR INDEX

PERSONAL AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

FILE NUMBER CORRELATION

SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 39 first-level and 293 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semi-monthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope definitions and limitations is available as DOE/TIC-4584-R6 from NTIS for $9.50.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
- 08 Alternative Fuels
- 03 Electric-Powered Systems
- 07 Emission Control
- 02 External Combustion Engines
- 05 Flywheel Propulsion
- 04 Hybrid Systems
- 01 Internal Combustion Engines
- 06 Vehicle Design Factors

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
- 03 Chemicals Metabolism and Toxicology
- 04 Other Environmental Pollutant Effects
- 01 Radiation Effects
- 02 Thermal Effects

55 BIOMEDICAL SCIENCES, BASIC STUDIES
- 30 Agriculture and Food Technology
- 01 Behavioral Biology
- 02 Biochemistry
- 03 Cytology
- 04 Genetics
- 06 Medicine
- 05 Metabolism
- 07 Microbiology
- 08 Morphology
- 09 Pathology
- 10 Physiological Systems
- 20 Public Health

40 CHEMISTRY
- 01 Analytical and Separations Chemistry
- 08 Combustion Pyrolysis, and High-Temperature Chemistry
- 04 Electrochemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry

01 COAL AND COAL PRODUCTS
- 05 By-Products
- 40 Combustion
- 09 Environmental Aspects
- 60 Health and Safety
- 70 Legislation and Regulations
- 50 Marketing and Economics
- 20 Mining
- 04 Processing
- 06 Properties
- 10 Reserves and Exploration
- 30 Transport and Handling
- 08 Waste Management

30 DIRECT ENERGY CONVERSION
- 02 EHD Generators
- 05 Fuel Cells
- 01 MHD Generators
- 08 Miscellaneous Converters
- 04 Thermionic Converters
- 03 Thermoelectric Generators

20 ELECTRIC POWER ENGINEERING
- 02 Environmental Control Technology
- 01 Power Plants and Power Generation
- 03 Power Transmission and Distribution

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
- 01 Buildings
- 09 Education and Public Relations
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 02 Transportation

29 ENERGY PLANNING AND POLICY
- 10 Conservation
- 80 Consumption and Utilization
- 02 Economics and Sociology
- 60 Electric Power
- 01 Energy Analysis and Modeling
- 03 Environment, Health, and Safety
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 04 Natural Resources
- 06 Nuclear Energy
- 30 Policy, Legislation, and Regulation
- 05 Research, Development, Demonstration, and Commercialization
- 20 Supply, Demand, and Forecasting
- 07 Transport and Storage
- 90 Unconventional Sources and Power Generation
- 08 Waste Heat Utilization

25 ENERGY STORAGE
- 09 Batteries
- 04 Capacitor Banks
- 08 Chemical
- 02 Compressed Gas
- 05 Flywheels
- 07 Liquefied Gas
- 01 Magnetic
- 03 Pumped Hydro
- 06 Thermal

42 ENGINEERING
- 10 Combustion Systems
- 08 Electronic Circuits and Devices
- 02 Facilities and Equipment
- 01 General Engineering
- 04 Heat Transfer and Fluid Flow
- 03 Lasers
- 30 Marine Engineering
- 05 Materials Testing
- 40 Pollution Control Equipment
- 50 Power Cycles
- 06 Safety Engineering
- 20 Underground Engineering
- 07 Vacuum Engineering
- 09 Waste Processing Plants and Equipment

52 ENVIRONMENTAL SCIENCES, AQUATIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport

52 ENVIRONMENTAL SCIENCES, AQUATIC (CONT.)
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

53 ENVIRONMENTAL—SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements
- 01 Social and Economic Studies

45 EXPLOSIONS AND EXPLOSIVES
- 01 Chemical
- 03 Explosion Detection
- 02 Nuclear

70 FUSION ENERGY
- 02 Fusion Power Plant Technology
- 01 Plasma Research

99 GENERAL AND MISCELLANEOUS
- 05 Civilian Defense
- 03 Information Handling
- 04 Law
- 01 Management
- 02 Mathematics and Computers

58 GEOSCIENCES
- 04 Geochemistry
- 01 Geology and Hydrology
- 02 Geophysics
- 03 Mineralogy, Petrology, and Rock Mechanics
- 05 Oceanography

15 GEOTHERMAL ENERGY
- 07 By-Products
- 10 Direct Energy Utilization
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 02 Geology and Hydrology of Geothermal Systems
- 20 Geothermal Data and Theory
- 09 Geothermal Engineering
- 03 Geothermal Exploration and Exploration Technology
- 08 Geothermal Power Plants
- 04 Legal and Institutional Aspects
- 01 Resource Status and Assessment

57 HEALTH AND SAFETY

13 HYDRO ENERGY
- 05 Economics and Management
- 06 Environmental Aspects
- 03 Plant Design and Operation
- 07 Power-Conversion Systems
- 04 Regulations and Licensing
- 01 Resources and Availability
- 02 Site Geology and Meteorology

08 HYDROGEN
- 07 By-Products
- 09 Environmental Aspects
- 06 Industrial and Commercial Use
- 04 Marketing and Economics
- 01 Production
- 08 Properties
- 05 Safety
- 02 Storage
- 03 Transport

44 INSTRUMENTATION
- 03 Miscellaneous Instruments
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 01 Radiation Instrumentation
- 04 Well Logging Instrumentation

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 03 Isotopic Power Supplies
- 01 Physical Isotope Separation
- 02 Radiation Sources

36 MATERIALS
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 01 Metals and Alloys
- 06 Other Materials
- 04 Polymers and Plastics

03 NATURAL GAS
- 09 Artificial Stimulation
- 40 Combustion
- 03 Drilling, Production, and Processing
- 08 Environmental Aspects
- 02 Geology and Exploration
- 05 Health and Safety
- 10 Legislation and Regulation
- 06 Marketing and Economics
- 04 Products and By-Products
- 30 Properties
- 01 Reserves
- 50 Storage
- 20 Transport, Pipelines, and Handling
- 07 Waste Management

05 NUCLEAR FUELS
- 06 By-Products
- 05 Enrichment
- 30 Environmental Aspects
- 02 Exploration
- 04 Feed Processing
- 07 Fuels Production and Properties
- 40 Health and Safety
- 10 Marketing and Economics
- 03 Mining
- 50 Regulations
- 01 Reserves
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 20 Waste Management

21 NUCLEAR POWER PLANTS
- 08 Economics
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 05 Power Reactors, Breeding
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 09 Process Heat Reactors
- 07 Regulation and Licensing

22 NUCLEAR REACTOR TECHNOLOGY
- 02 Components and Accessories
- 04 Control Systems
- 05 Environmental Aspects
- 03 Fuel Elements
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety
- 06 Research, Test, and Experimental Reactors
- 01 Theory and Calculation

04 OIL SHALES AND TAR SANDS
- 06 Direct Uses and By-Products
- 03 Drilling, Fracturing, and Mining
- 10 Environmental Aspects
- 07 Health and Safety
- 08 Marketing and Economics
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 20 Regulations
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 09 Waste Research and Management

09 OTHER SYNTHETIC AND NATURAL FUELS
- 02 Alcohol Fuels
- 06 Gaseous Waste Fuels
- 01 Hydrocarbon Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 05 Liquid Waste Fuels
- 04 Solid Waste and Wood Fuels

43 PARTICLE ACCELERATORS
- 03 Auxiliaries and Components
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 01 Design, Development, and Operation
- 04 Storage Rings

02 PETROLEUM
- 50 Combustion
- 03 Drilling and Production
- 09 Environmental Aspects
- 02 Geology and Exploration

02 PETROLEUM (CONT.)
06 Health and Safety
10 Legislation and Regulation
07 Marketing and Economics
04 Processing
05 Products and By-Products
30 Properties
01 Reserves
40 Storage
20 Transport, Pipelines, and Handling
08 Waste Management

64 PHYSICS I
01 Astrophysics and Cosmology
02 Atmospheric Physics
03 Atomic, Molecular, and Chemical Physics
04 Fluid Physics
50 High Energy Physics

65 PHYSICS II
90 Communication, Education, History, and Philosophy
80 Mathematical Physics
50 Medical Physics
10 Nuclear Physics
40 Radiation and Shielding Physics
60 Solid-State Physics
61 Superconductivity
70 Theoretical Physics

14 SOLAR ENERGY
03 Economics
04 Environmental, Legal, and Institutional Aspects
20 Heat Storage
08 Ocean Energy Systems
06 Photovoltaic Power Systems
01 Resources and Availability
10 Solar Collectors and Concentrators
05 Solar Energy Conversion
07 Solar Thermal Power Systems
09 Solar Thermal Utilization

16 TIDAL AND WAVE POWER
04 Economics
05 Environmental Aspects
03 Regulations
07 Tidal Power Plants
08 Wave Energy Converters

17 WIND ENERGY
01 Availability (Climatology)
04 Economics
05 Environmental Aspects
03 Regulations
06 Wind Energy Engineering

CORPORATE AUTHOR INDEX

PERSONAL AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

FILE NUMBER CORRELATION

ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

29152 **(ORNL—6264) Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985.** Bradley, R.A. (Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 122p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86009998.

This report covers progress made during the period October 1 through December 31, 1985, for research and development projects that contribute to the advancement of various fossil energy technologies. Projects on the Fossil Energy Program are supported by DOE Office of Fossil Energy, DOE Office of Basic Energy Sciences, and the Tennessee Valley Authority.

29153 **(STEV-BF—85-16) MINO feasibility study. Concluding report.** Sinclair, A.; Waldheim, L. (Statens Energiverk, Stockholm (Sweden)). Nov 1985. 138p. (STUDSVIK-EB—85-72). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751686.

As a part of the development programme for the MINO process two feasibility studies have been made of peat-based, grass-root plants for the production of 1000 ton/day of methanol and ammonia. The detailed process sequence and estimates of the TIC for these plants have been described previously in two seperate reports. In this final concluding report, brief descriptions of the plants are given together with figures for production and consumption of products, by-products, raw material and utilities. The production cost of methanol and ammonia are also estimated to be 2006 SEK/ton and 2156 SEK/ton respectively at a peat price of 400 SEK/ton in a 1000 ton/day plant. The economy of scale is discussed for plants sizes of 500 ton/day and 2000 ton/day methanol and 500 ton/day ammonia respectively. The results of this study is compared to results of a similar study made previously by others. With 6 refs.

0104 Processing

REFER ALSO TO CITATION(S) 29176, 29182, 29184, 29198, 29679, 29680, 30183, 30210, 30725

29154 **(DOE/CH/10088—2018) Great Plains Coal Gasification Plant start-up and modification report.** Miller, W.R.; Honea, F.I.; Lang, R.A.; Berty, T.E.; Delaney, R.C.; Hospodarec, R.W.; Mako, P.F. (Fluor Technology, Inc., Irvine, CA (USA). Advance Technology Div.). Mar 1986. Contract AC02-82CH10088. 130p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE86009536.

This report will help in designing future coal conversion plants by documenting the areas which need additional research to obtain more reliable process data, more careful planning and equipment selection. The scope of this report is to: describe the problem with the particular process or item of equipment; identify the modification that was implemented to correct the problem; evaluate the impacts of the modification; and document the cost of the modification. Contents include the following: (1) process modifications (coal, oxygen and steam, gasification and gas processing, sulfur recovery, flare system, liquid processing, ash handling and solids disposal, other systems); (2) start-up schedule; (3) SNG production; (4) environmental data; and (5) cost data.

29155 **(DOE/FE/55014—T21) [Great Plains Coal Gasification Associates]. Quarterly technical progress report.** (ANG Coal Gasification Co., Beulah, ND (USA)). 30 Apr 1986. Contract FM02-82FE55014. 112p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86010246.

The operations of the Great Plains Gasification plant are reported for the first quarter of 1986. Contents include the following: (1) lignite coal production; (2) SNG production; (3) SNG gas quality; (4) by-products production and inventories; (5) on-stream factors; (6) raw material, product and by-product consumption and energy consumption for plant operations; (7) plant modifications-1986 budget; (8) plant maintenance; (9) safety; (10) industrial hygiene; (11) medical services; (12) environmental executive summary; and (13) quality assurance/quality control activities.

29156 **(DOE/MC/19210—2043) Computed tomography of coals. Quarterly technical progress report No. 8, July 1-September 30, 1984.** Maylotte, D.H.; Kosky, P.G.; Spiro, C.L.; Lamby, E.J. (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center). 1984. Contract AC21-82MC19210. 54p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86010137.

The pyrolysis apparatus designed to fit inside the aperture of an x-ray computed tomography instrument has been further altered to accommodate gasification experiments. The following conditions were employed: Pittsburgh coal, carbon dioxide gasification; Illinois No. 6 coal, carbon dioxide gasification; North Dakota A lignite, carbon dioxide gasification; Illinois No. 6 coal, steam gasification; Illinois No. 6 coal, carbon dioxide gasification, rubidium catalyst added in the form of a plugged hole; and Illinois No. 6 coal, carbon dioxide gasification, rubidium catalyst added in the form of an evaporated solution. In general, gasification proceeded smoothly in the temperature range 850 to 1000°C, though at the highest temperature, gasification was often sufficiently rapid as to create gross movement of the chars, thus obscuring meaningful kinetic parameters. Where catalysts were present in the form of predrilled holes, the catalyst action was the dominant process. When dispersed along the edges by deposition from solution again, edge recession dominated by catalytic action was observed. The lignite char had high inherent reactivity due to adventitious catalytic matter coupled with an open porous char structure. This was more reactive than the Illinois char which was further more reactive than the Pittsburgh char. Catalyzed chars were highly reactive in the region of high catalyst concentration. Catalyst mobility was noted. 1 ref., 32 figs., 3 tabs.

29157 **(DOE/METC—86/2025) Great Plains Gasification Project process stream design data.** Honea, F.I. (EG and G/Washington Analytical Services Center, Inc., Morgantown, WV (USA)). Sep 1985. Contract AC21-85MC21353. 199p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86003718.

The Great Plains Coal Gasification Plant (GPGP) is the first commercial coal-to-synthetic natural gas plant constructed and operated in the United States. This process stream design data report provides non-proprietary information to the public on the major GPGP process streams. The report includes a simplified plant process block flow diagram, process input/output diagrams, and stream design data sheets for 161 major GPGP process and effluent streams. This stream design data provides an important base for evaluation of plant and process performance and for verification of the Department of Energy's ASPEN (Advanced System for Process Engineering) computer simulation models of the GPGP processes. 8 refs., 22 figs., 2 tabs.

29158 **(DOE/METC—86/4060) Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures.** Khan, M.R. (USDOE Morgantown Energy Technology Center, WV). Mar 1986. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86006603.

The objective of this investigation is to optimize devolatilization conditions of coal with an aim to increasing product quality and yield. It has been observed that mild devolatilization (heating coal slowly to 500°C in a batch reactor) of coal in the presence of CaO (10 to 20 weigh percent) can produce a relatively high-quality liquid fuel (containing low sulfur, low oxygen, low viscosity, low Conradson carbon residue, and low pour point). Compared to that occurring in rapid heat-up processes, the residence time of both the liquid and gaseous products is significantly greater in a batch or fixed-bed (slow heating) system. It is proposed that this increased residence time facilitates greater secondary reactions of the primary products in the coal bed with the added CaO. By allowing sufficient contact, a high-quality liquid fuel is produced. The hydrogen-carbon (H/C) atomic ratio of the liquids generated in such a relatively low-cost, simple reaction configuration can vary from 1.3 to 1.5 for high-volatile coals such as Illinois No. 6 or Pittsburgh No. 8. These H/C ratios are superior to those reported for various other processes such as Solvent Refined Coal (SRC-II) or Coal Oil Energy Development process tar. The presence of CaO in the fuel bed markedly reduces H_2S in the gas phase and decreases heteroatoms (sulfur and oxygen) in the liquids. The liquid produced in the presence of CaO has a lower viscosity, lower pour point, lower Conradson carbon residue, and fewer phenolic and aromatic compounds than that produced in the absence of CaO. The resulting high-quality liquid fuel produced in this low-cost operation may serve as a transport fuel in certain applications without requiring further significant upgrading. Or it may serve as an octane-booster additive to existing transport fuels. 9 refs., 3 figs., 3 tabs.

29159 **(DOE/PC/60787—10) Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986.** Crynes, B.L.; Seapan, M. (Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering). 24 Apr 1986. Contract FG22-83PC60787. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009738.

Five experimental runs were completed with the objective to evaluate quinoline feed concentration effects. In all five experiments the pressure was maintained at 12.4 MPa with a space time of 0.5 h with a temperature of 350°C, except for one experiment which had a temperature of 370°C and space time of 1.0 h. All experiments used a Topsoe TK-771, Ni-Mo catalyst. The concentrations of quinoline in the feedstocks varied from 10 to 20 to 30 wt % in n-hexadecane. Product analyses revealed that the quinoline in the feedstock inhibited the hydrocracking steps causing the primary product, propylcyclohexane, to decrease with increasing quinoline in the feedstock. Remaining intermediate products from the reaction network followed the same trend with changes in feedstock concentration of quinoline with exception of 5,6,7,8-tetrahydroquinoline and propylbenzene. Increasing quinoline concentration in the feedstock also resulted in marked increase in deactivation of the catalyst for overall nitrogen removal. 6 figs., 6 tabs.

29160 **(DOE/PC/60800—10) Active sites in char gasification. Quarterly technical progress report, 1 January-31 March 1986.** Calo, J.M.; Suuberg, E.M.; Wojtowicz, M.; Perkins, M.; Lilly, W. (Brown Univ., Providence, RI (USA). Div. of Engineering). 1986. Contract FG22-83PC60800. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009824.

This project is concerned with the study of the nature and behavior of "active sites" in the gasification of chars produced from synthesized model compounds, primarily those of the phenol-formaldehyde family of resins. Of the various techniques that have been identified to accomplish the objectives of this project, the development of a reliable measure of the total active surface area (TASA) of the chars is one of the most important. The primary technique that has been pursued in the current work is O_2 chemisorption. In the present quarter, we have looked more closely at the question of what precisely is being measured by the oxygen chemisorption technique. We have been particularly concerned with the myriad of conditions employed to characterize TASA, and how these somewhat arbitrarily chosen conditions can affect what is reported as TASA. There is, in particular, a concern that "young chars" may behave quite differently from "old chars," and that the mechanism of oxygen chemisorption is quite different on a hydrogen-rich char as opposed to a hydrogen-poor char. The project will focus much more closely in the future on issues of mechanism of chemisorption, and how these may or may not relate to the practical problems of estimating char combustion and/or gasification reactivity. In this report, we present a brief summary of relevant literature in the area and describe some tests that have been performed to highlight the nature of the problem, and to show that the conclusions are largely the same regardless of whether we consider our well-defined model chars, or an actual coal char. 42 refs., 2 figs., 1 tab.

29161 **(DOE/PC/70801—T6) Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986.** Eckert, C.A. (Illinois Univ., Urbana (USA). Dept. of Chemical Engineering). 1986. Contract FG22-84PC70801. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009772.

High temperature solvents, like ammonia, are being investigated. These solvents are likely to prove more appropriate than lower temperature solvents like carbon dioxide for extraction processes with coal. Accurate comparisons of the solvents will be made when several compounds have been tested. A decorated lattice-gas has been used successfully to model supercritical solubilities and infinite dilution partial molar volumes near the critical point. This is the first time such a model has been extended for correlation with experimental data. Since the model is theoretically sound (exact for dilute solutions) this work is particularly encouraging. 2 figs.

29162 **(DOE/PC/70802—T2) Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986.** Kwon, K.C. (Tuskegee Inst., AL (USA). Dept. of Chemical Engineering). 1986. Contract FG22-84PC70802. 37p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009518.

Effects of heating rates on liquefaction of Kentucky No. 9 coal were investigated in the presence of both various hydrogen donor solvents and presulfided fresh Shell 324 M catalyst as part of Task 2. A series of coal liquefaction runs were conducted for Kentucky No. 9 coal, increasing coal liquefaction temperatures from 200°C or 300°C up to 380°C and holding liquefaction temperatures at 380°C for 0 or 15 min. The main objectives of this study are to investigate effects of heating rates on catalytic activities, to identify interactions between hydrogen donor solvents and catalysts, and to study effects of initial temperatures on deactivation of catalysts in the early stage of liquefying Kentucky No. 9 coal. Another series of coal liquefaction experiments were performed, using Kentucky No. 9 coal and hexadecane as a physical solvent, instead of 1-methylnaphthalene, to investigate interactions between physical solvents and catalytic activities in the early stage of liquefying Kentucky No. 9 coal. 16 figs., 8 tabs.

29163 **(DOE/PC/70811—5) Improved coal conversion in CO/water systems. Quarterly report No. 5, September 4, 1985-December 3, 1985.** Ross, D.S.; Hum, G.; Miin, T.C. (SRI International, Menlo Park, CA (USA)). Mar 1986. Contract FG22-84PC70811. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009296.

The report for this quarter deals with the conversions of Illinois No. 6 coal with different formate salts. The work was conducted to develop understanding of the specific chemistry of hydrothermal formate solutions and coal, because formate is considered the specific reducing agent in CO/water conversions. The ratios of the product gases H_2, CO, and CO_2 were to be used to help distinguish between different modes of decomposition of formate. The findings were surprising; striking differences were noted in the spreads for THS-soluble and toluene-soluble fractions, depending on the specific formate salt used. In view of the findings, we have elected to prepare this report as a manuscript, with the understanding that the results of supporting work now in progress will be introduced into the manuscript to complete it. 11 refs., 1 tab.

29164 (EUR—10063-FR) Developments in control systems for the thermal regime of batteries and coking of coal. (Commission of the European Communities, Luxembourg). 1985. 31p. (In French). European Community Information Service, 2100 M St., NW, Suite 707, Washington, DC 20057.

Report on ECSC contract 7220-EB/320.

An experimental oven battery at the HBL's Carling coke works has been used by the Marienau Pyrolysis Centre for the installation and development of an automatic control system for oven firing based on: 1. the continuous measurement of the battery temperature by means of thermocouples incorporated in the refractory bricks of the oven top section; 2. the coke temperature at each push, which is estimated in two different ways - a) by measuring the temperature (or composition) of the distillation gases and b) by measuring the coke surface temperature during pushing by means of infra-red pyrometers mounted on the coke-guide. The work undertaken basically consisted of the following: installation and development of the above-named measurement sensors; organisation of a control room for centralised data collection; preparation of the system software. An operational guide is used to process all the signals received from the measurement sensors so that the plant operator can select the required temperatures and make control adjustments at will. (6 refs.)

29165 (EUR—10064-FR) Contribution to the study of the mechanisms of coke formation. (Commission of the European Communities, Luxembourg). 1985. 58p. (In French). European Community Information Service, 2100 M St., NW, Suite 707, Washington, DC 20057.

Report on ECSC contract 7220-EB/318.

Coke texture is determined by plastic fusion, a phase in the course of which the plane polyaromatic molecules have sufficient mobility to align themselves parallel to one another. The resulting arrangement is associated with the interaction between the different components of the blend and is largely responsible for determining the physical and chemical properties of the coke produced. The structural characteristics can be established by optical microscopy, by applying a method of operation which is widely used, and additionally by electron microscopy, which operates on a much finer scale. By employing suitable measuring methods, this technique is capable of defining the molecular make-up of the carbonaceous material. These analysis methods have been applied to a certain number of coke samples prepared in a 400 kg oven from typical feed coals. The results obtained have been linked with the physical and chemical properties. Some of the characteristics have been calculated on the basis of coke produced from pure coal by means of an additivity hypothesis. The estimated values were compared with the measured values so as to investigate the interaction between the coal samples. (49 refs.)

29166 (ICTIS/M—0193) Gasification - general overview. Bjerle, I. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 14p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

A general overview of coal gasification is presented, covering historical aspects, gasification chemistry (including catalysis and pressure and temperature effects) and gasification technology. Methods of supplying heat, gasification reactors, gasification systems and environmental problems are considered. (5 refs.)

29167 (ORNL/FMP—86/1) Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985. Bradley, R.A. (Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 414p. NTIS, PC A18/MF A01; 1; GPO Dep. File Number DE86009997.

The objective of the AR & TD Fossil Energy Materials Program is to conduct research and development on materials for fossil energy applications with a focus on the longer-term and generic needs of the various fossil fuel technologies. The program includes research aimed toward a better understanding of materials behavior in fossil energy environments and the development of new materials capable of substantial enhancement of plant operations and reliability. The management of the Program has been decentralized to the DOE Oak Ridge Operations Office (ORO) and the Oak Ridge National Laboratory (ORNL) as technical support contractor. The ORNL Fossil Energy Materials Program Office compiles and issues this combined quarterly progress report from camera-ready copies submitted by each of the participating subcontractor organizations. This report of activities on the program is organized in accordance with a work breakdown structure in which projects are organized according to materials research thrust areas. It is the intent of the AR & TD Fossil Energy Materials Program to sponsor materials research which is generic to a number of fossil energy technologies. It is hoped that this series of AR & TD Fossil Energy Materials Program quarterly progress reports will aid in the dissemination of information developed on the program.

29168 (STEV-BF—85-8) Hydrotreatment studies of Swedish peat products. Progress report No. 3 (Final). Shabtai, J.S.; Shukla, Y. (Statens Energiverk, Stockholm (Sweden)). Jan 1985. 40p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86751674.

This report summarizes research activities during the final 3-month period (June 16 - September 15, 1984) of the project on hydrotreatment of Swedish peat products. Results obtained allow for the drawing of several critically important conclusions. Partially deoxygenated peat-derived feedstocks, produced by the Royal Institute of Technology (Stage I) Process, are extremely susceptible to convesion into high quality hydrocarbon oils by hydrotreatment with appropriate sulfided Co Mo catalysts under moderate processing conditions (temperature, 350-370 degrees C; hydrogen pressure, 2700-3000 psig). The hydrocarbon oils obtained by hydrotreatment of Swedish peat-derived products contain an unusually high portion of distillable fractions. The total (non-fractionated) product is easily converted into a high-quality hydrocarbon oil. In view of the very high aliphaticity of the Swedish peat products the hydro processing of such products involves very low hydrogen consumption. The extent of attendent gasification is low. The specific sulfided Co Mo catalysts show high activity for hydrooxygenenation of ethers, alcohols, phenols, and carbonyl compounds.

29169 (STEV-BF—86-1) Gasification of sod peat in a fixed bed cocurrent gasifier. Svenningsson, P.J.; Thessen, G. (Statens Energiverk, Stockholm (Sweden)). Oct 1985. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86751687.

Two different types of sod peat have been tested in a cocurrent (down-draft) gasifier. The tests show that sod peat can be gasified successfully in such a unit. Conversion efficiences of above 75% have been achieved, calculated as chemical energy in the peat to chemical energy in the cold gas. The result depends mainly on humification level, ash content, moisture content of the peat and fraction of fines. Further work is needed to investigate the effects of these main parameters and to define a fuel specification suitable for gasification. The availability of suitable peat and the total production cost of heat and power from a sod peat gasification unit are other areas that require to be further studied. A possible application of small-scale sod peat gasification units is local, combined heat and power production in countries with good peat resources and a demand for space of process heating.

29170 The METC underground coal gasification research program for eastern bituminous coals. Martin, J.W.; Wieber, P.R.; Cooke, S.D. New York, NY; American Institute of Chemical Engineers (1985). 24p. (CONF-841121—). American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017.

From AIChE annual meeting; San Francisco, CA, USA (25 Nov 1984).

DOE's Morgantown Energy Technology Center's research program to develop an underground coal gasification technology applicable to eastern bituminous coals is discussed from the standpoint of the program's multi-year strategy, potential applications for the technology, current project status, and expected FY 1985 accomplishments.

29171 **Underground coal gasification: environmental update.** Dockter, L.; Mcternan, E.M. New York, NY; American Institute of Chemical Engineers (1985). 15p. (CONF-841121—). American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017.

From AIChE annual meeting; San Francisco, CA, USA (25 Nov 1984).

To evaluate the potential for ground water contamination by underground coal gasification, extensive postburn groundwater monitoring programs are being continued at two test sites in Wyoming. An overview of the environmental concerns related to UCG and some results to date on the two field sites are presented in this report.

29172 **The Centralia partial seam CRIP underground coal gasification experiment.** Stephens, D.R.; Cena, R.J.; Hill, R.W.; Thorsness, C.B. New York, NY; American Institute of Chemical Engineers (1985). 36p. (CONF-841121—). American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017. Contract W-7405-ENG-48.

From AIChE annual meeting; San Francisco, CA, USA (25 Nov 1984).

This report describes the result of the partial seam controlled retracting injection point (CRIP) underground coal gasification (UCG) field experiment carried out at the Washington Irrigation and Development Company (WIDCO) mine near Centralia, Washington, in the fall of 1983. The test was designed to take advantage of the high-wall geometry at the mine and was carried out near the site of the earlier (1981-1982) large-block experiments. The primary goals of the experiment were to test the CRIP concept and to further evaluate the site as a potential for the future development of UCG.

29173 **Underground coal gasification: status and promise.** Burwell, E.L. New York, NY; American Institute of Chemical Engineers (1985). 10p. (CONF-841121—). American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017.

From AIChE annual meeting; San Francisco, CA, USA (25 Nov 1984).

The US efforts in underground coal gasification (UCG) in the past decade, the current state-of-the-art, and its technical and economic promise as a viable synthetic fuel alternative are presented along with a short discussion of problems yet to be addressed.

0106 Properties

REFER ALSO TO CITATION(S) 29166, 29199, 29204, 29207, 29208, 29219, 29682, 30238, 30248

29174 **(DOE/PC/50803—T1) New mass spectral methods for coal characterization. Final report, July 15, 1982-September 14, 1985.** Cooks, R.G. (Purdue Univ., Lafayette, IN (USA). Dept. of Chemistry). 1985. Contract FG22-82PC50803. 70p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86010103.

The chemical nature of products derived from coal, whether resulting from liquefaction or some form of chemical degradation, is of particular interest (1) as a means of probing the chemical structure of coal, and (2) in order to optimize the products for potential uses, for example as a fuel or chemical feedstock. Studies of this nature can be enhanced by tandem mass spectrometry (MS/MS) which is particularly well-suited to the analysis of complex mixtures. The focus of this study was to tie a number of investigations, inlcuding characterization of products of specific chemical degradations, liquefaction processes and optimization of processing conditions, to a central theme; characterization of the chemical nature of coal. Investigations have shown the applicability of MS/MS to the analysis of both polynuclear aromatic hydrocarbons (PNAs) and related compounds, for example, hydrodenitrogenation products including tetrahydro nitrogen-containing PNAs, long chain alkyl PNAs, and sulfur-containing PNAs in a coal liquid examined after chemical reduction. These analyses have made use of all three of the principal scanning modes of MS/MS: daughter spectra for identification of specific constitutents, parent spectra for characterization of components having a common substructure, and neutral loss spectra for characterization of constitutents having a common functional group. Combining MS/MS with specific chemical degradation reactions as well as using differing modes of ionization, further enhances the utility of MS/MS as a means for addressing the complex nature of fuel materials. 12 refs., 45 figs., 4 tabs.

29175 **(DOE/PC/60015—36) Separation and characterization of coal derived components, 1 January 1986-31 March 1986.** Hurtubise, R.J.; Silver, H.F. (Wyoming Univ., Laramie (USA). Office of Univ. Research). 8 Apr 1986. Contract AC22-83PC60015. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009308.

The even and odd mass z series for several hydroxyl aromatic and nitrogen compound fractions were obtained and compared. The general chemical composition for several of the fractions has been determined. The normal-phase and reversed-phase high-performance liquid chromatography methods for the separation of hydroxyl aromatics from nondistillable coal-liquids is discussed in detail. Also, the separation and characterization of large-ring number polycyclic aromatic hydrocarbons in nondistillable, pyridine soluble coal-liquids is considered. Additional elemental analysis data was obtained from a high-performance liquid chromatographic silica sample. High amounts of chlorine, aluminum, calcium, and sodium were found. 2 figs., 2 tabs.

29176 **(DOE/PC/60039—8) Phase behavior of coal fluids: data for correlation development. Report for the period: November 1, 1985-January 31, 1986.** Robinson, R.L. Jr.; Bufkin, B.A. (Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering). 20 Mar 1986. Contract FG22-83PC60039. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86007958.

The overall objective of this study is to develop accurate predictive methods for representation of vapor-liquid equilibria in systems encountered in coal-conversion processes. The objectives of the present project include: (1) Measurements of binary vapor-liquid phase behavior data for selected solute gases (e.g., H_2, CO, CO_2, NH_3, H_2S) in a series of heavy, primarily aromatic, solvents (e.g., benzene, naphthalene, phenanthrene) to permit evaluation of interaction parameters in models for phase behavior. Both solubilities of the gases in the liquid phase and of the heavy solvents in the gas phase will be determined. (2) Measurements on ternary systems in which high-melting-point solvents (e.g., pyrene, chrysene, triphenylene) are dissolved in more volatile aromatics to provide mixed solvents; this will facilitate measurements at lower temperatures than would be possible in the pure high-melting-point aromatic solvents, which would be solid at operating conditions. (3) Evaluation of existing equations-of-state and other models for representation of phase behavior in systems of the type studied experimentally; development of new correlation frameworks as needed. (4) Generalization of the interaction parameters for the solutes studied to a wide spectrum of heavy solvents; presentation of final results in formats useful in the design/optimization of coal liquefaction processes. During the present report period, data have been obtained for the solubility of CO_2 in n-decane at 344.2°K and for ethane in n-decane at 310.9°K, and in naphthalene at 373.2 and 423.2°K. 5 refs., 1 fig., 1 tab.

29177 **(DOE/PC/60791—9) Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985.** Zilm, K.W. (Yale Univ., New Haven, CT (USA). Dept. of Chemistry). Apr 1986. Contract FG22-83PC60791. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010155.

This report covers the progress made on the title project during the last quarter. During the last three months we have concentrated on further developing a new 2-D NMR method that should be useful for coals. As outlined in a previous report this new technique separates the contribution of methines, methylenes and methyl or quaternary carbons to the carbon-13 CPMAS spectra of coals. In contrast to the heteronuclear shift correlation method, which observes only protonated carbons, this method observes all carbon centers seen in a standard CPMAS spectrum. The method has been successfully applied to a rather complex molecule, cholesteryl acetate. Even though there is severe spectral overlap in this

model compound's CPMAS spectrum, the dipolar-shift correlation method allows us to assign each resonance. The distribution of functional types of carbon determined in this experiment appears to be close to quantitative. In addition we have begun to test our ultra high field CPMAS equipment on chemically modified coals. 4 figs.

29178 **(DOE/PC/70006—9) Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986.** Yesavage, V.F.; Kidnay, A.J. (Colorado School of Mines, Golden (USA). Dept. of Chemical Engineering and Petroleum Refining). 30 Apr 1986. Contract FG22-84PC70006. 54p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009823.

On July 15, 1984, work was initiated on a program to study the enthalpy and phase behavior of coal derived liquid model compound mixtures. During the seventh quarter, preliminary enthalpy measurements for the 5/6:1/6 m-cresol/tetralin binary mixture have been completed and are included in Appendix A at the end of this report. Vapor liquid equilibria VLE measurements for the m-cresol/tetralin system have been completed for four isotherms; 250, 275, 300, 325°C. These results and a summary of progress to date for the VLE apparatus are in the appendix at the end of this report. 10 refs., 15 figs., 6 tabs.

29179 **(DOE/PC/70061—7) Polydisperse coal slurry rheology. Quarterly report.** Probstein, R.F. (Massachusetts Inst. of Tech., Cambridge (USA)). Apr 1986. Contract FG22-84PC70061. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009841.

The dimensionless groups defined (Peclet number, shear attraction number and the shear repulsion number) can be used to characterize the essential features of suspension rheology. Examination of these groups makes the importance of characteristic particle size clear. The shear-repulsion number increases as the square of the particle size, while both the Peclet number and the shear-attraction number increases as the cube. This means that these parameters increase rapidly with increasing particle size, implying a rapid increase in the relative importance of shear forces with increasing particle size. For colloidal particles, for which the average particle size is about 1 micron, the dimensionless parameters tend to small values and non-Newtonian effects become important. For large particles with an average size larger than 50 microns, on the other hand, these parameters become much larger than unity and hydrodynamic forces dominate so that any non-Newtonian behavior should vanish. This is exactly what is required by the spatially periodic suspension model. The geometric variables of the spatially periodic model were adjusted to yield the same maximum packing fraction as that given by the truly bimodal suspension results. We then followed an inverse procedure, as previously, and determined the coarse and colloidal volume fractions of the six slurries that would yield the experimental low shear extrapolated viscosities. The reason why the extrapolated results were used is because the Farris data is applicable in the low shear limit only.

29180 **(DOE/PC/70781—T5) Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986.** Turian, R.M. (Illinois Univ., Chicago (USA). Dept. of Chemical Engineering). 15 Apr 1986. Contract FG22-84PC70781. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009849.

Experiments on the gravity sedimentation of coal-water mixtures (CWM) were carried out as a function of suspension pH at constant solids concentration, and as a function of solids concentration at fixed pH. The data reported here pertain to suspensions made up of a high sulfur Illinois No. 6 coal with a total sulfur content of 4.96% on a dry, ash free basis. The analysis of specific ion concentrations of the slurry is given in Table 1. For a 50% by weight slurry the sedimentation curves are presented in Fig. 1, which provides a plot of the volume ratio, V(t)/V(0). Direct measurements of the yield stress/solids concentration dependence using the vane method were made at CWM pH values of 2.30, 2.99, 3.50 and 7.12. Table 3 presents an abridged listing of these measurements. The data in Table 3 are obtained by cross-plotting the yield stress/concentration data to reduce them to the yield stress/pH (or equivalently zeta potential) form at various levels of solids concentration. 1 ref., 2 figs., 3 tabs.

29181 **(DOE/PC/70782—6) Electron spin mapping of coal molecular structure by ENDOR. Quarterly technical progress report.** Belford, R.L. (Illinois Univ., Urbana (USA)). 15 Jan 1986. Contract FG22-84PC70782. 11p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009770.

For several years, a major research gaol of our labortory has been the development of non-destructive spectroscopic techniques designed to study the molecular structure present in whole coal macerals. Our interest in this grows from our desire to know in more detail the microscopic structure of the organic components in coal in order to better determine the effects of various coal beneficiation technologies (e.g., various desulfurization techniques) on that structure. In this paper we wish to report on our progress using one very promising approach - Electron Spin Echo (ESE) spectroscopy. We first briefly review the ESE technique and then present results obtained from Illinois No. 6 whole coal. 5 refs., 9 figs.

29182 **(DOE/PC/70792—T6) Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986.** Narayan, R. (Purdue Univ., Lafayette, IN (USA). Lab. of Renewable Resources Engineering). Apr 1986. Contract FG22-84PC70792. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010012.

Three consecutive treatments of Illinois No. 6 coal with K-CE (potassium-crown ether) reagent had resulted in a total of 52% solubilized coal and confirms our previous results. The reaction of 2-naphthol with K-CE reagent produced 2-tetralone, 5,8-dihydro-2-naphthol and 5,6,7,8-tetrahydro-2-naphthol as the major products. This model compound results explain the appearance of carbonyl absorptions in the coal-K-CE reaction extracts and suggests that reduction of naphthol units to tetralone structures as a major reaction pathway in the coal-K-CE reaction. Reaction of coal (THF-1) with semicarbazide-bonded-silica gel resulted mainly in an irreversibly binding of the coal to the silica-gel.

29183 **(DOE/PC/70799—T5) Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985.** Taylor, L.T. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Apr 1986. Contract FG22-84PC70799. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009566.

The analysis of nonvolatile coal-derived liquefaction products for minor and trace components which contain nitrogen, oxygen, or sulfur presents unique challenges. Justification for their analysis rests on the premise that heteroatom - containing materials can aid and/or hinder the conversion process. This proposal builds upon our efforts during the initial three year grant period regarding the interfacing of Fourier transform infrared spectrometry with size exclusion and normal phase chromatography for the analysis of coal-derived products. Four objectives are proposed: (1) optimize the HPLC-FTIR interface in terms of detectability, identifiability and chromatography, (2) extend the HPLC-FTIR approach to reversed phase chromatography wherein more efficient separation are possible for heteroatom species, (3) determine the feasibility of interfacing supercritical fluid chromatography with FTIR for the analysis of coal-derived products and (4) employ hyphenated methods to ascertain on a molecular level the changes that occur in a nonvolatile coal-derived product when various liquefaction parameters are varied. The primary objective of this project was to continue the development of an interface device for the coupling of reversed phase liquid chromatographic separations with Fourier Transform Infrared detection. 2 refs., 11 figs.

29184 **(DOE/PC/80911—T2) Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986.** Chung, K.E.; Goldberg, I.B. (Rockwell International Corp., Thousand Oaks, CA (USA). Science Center). 1986. Contract FG22-85PC80911. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010093.

The objectives of this investigation are: (1) quantitative characterization of a bituminous coal in terms of its major compositon and molecular structural characteristics needed to assess its lique-

faction reactivity, and (2) extending this characterization methodology for a specific examination of aliphatic linkages of the coal. The characterization methodology consists of a controlled depolymerization of the sample coal, solvent extraction of the products, and detailed analysis of the product fractions. For the specific examination of aliphatic linkages, well-characterized soluble fractions from the same coal will be investigated by a transalkylation reaction. An Illinois No. 6 coal was solubilized in reactions with NaOH/ethanol/H_2O at 260° and 300°C, which are called Ill-260 and Ill-300, respectively. The product from Ill-260 was fractionated, and the fractions are being analyzed. The product from Ill-300 is being fractionated. In Ill-260, 86% of the feed was converted to soluble products with an additional 1.6% converted to CO_2. Carbon recovery was 97.3%, and hydrogen and oxygen recoveries were 108% and 123%, respectively. Most of ash, 94%, was removed in the reaction. The atomic H/C ratio of the condensed-phase product increased to 0.89 from 0.80 of the feed coal. The atomic ratio of incorporated hydrogen to oxygen was 2, indicating the hydrolysis of oxygen functional groups in the solubilization reaction. The product distribution in Ill-260 was substantially different from those with two low-rank coals in our earlier studies. The in spectra of the product fractions showed weaker absorptions due to -OH and -COOH than similar fractions from the low-rank coals. The differences are attributed to dissimilar contents of oxygen functional groups in the coals. The solubilization reaction was effective for "depolmerization" of the bituminous coal.

29185 **Influence of carbonaceous particles on the interaction of coal combustion stack ash with organic matter.** Griest, W.H.; Tomkins, B.A. (Oak Ridge National Lab., TN). *Environmental Science and Technology;* 20: No. 3, 291-295(Mar 1986). Contract AC05-84OR21400.

Stack ash samples were fractionated by aerodynamic size, and the largest particle size fraction was separated into constituent particle type subfractions. Comparison of the mineral, magnetic, and carbonaceous particles showed that coked coal is responsible for the sorptivity of the large particle size fraction for carbon-14 labeled benzo[a]pyrene ([^{14}C]BaP) and for low solvent extraction recoveries. Elevated levels of organic matter and surface area also are contributed by the carbonaceous particles. In contrast, solvent extraction recoveries of polar degradation products of [^{14}C]BaP are attributable more to the mineral and magnetic particles and to exposure of the ash to light and oxygen. Analysis of bulk ash samples may not fully reflect the true organic composition of stack ash. 27 references, 1 figure, 4 tables.

0108 Waste Management

REFER ALSO TO CITATION(S) 29678, 29685, 29687, 29689, 29690, 29692, 29698, 29701, 29703, 29708, 29710, 29722, 29723, 29729, 29730, 29732, 29734, 29740, 30204

29186 **(DOE/PC/60802—10) Aerosol formation from pulverized coal combustion. Final technical report.** Peterson, T.W.; Linak, W.P. (Arizona Univ., Tucson (USA). Dept. of Chemical Engineering). 15 Jan 1986. Contract FG22-83PC60802. 249p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE86005495.

Pulverized samples of Utah bituminous, Beulah (North Dakota) low Na lignite, Beulah high Na lignite and Texas (San Miguel) lignite coals were burned at a rate of 2.5 kg/hr in a laboratory furnace under various (overall fuel lean) combustion conditions. Particle size distributions (PSD) and size segregated particle filter samples were taken at various positions within the convection section. Temperature and gas concentrations were measured. The evolution of the submicron PSD within the convection section for the four coals was similar, although the location of the initial particle mode at the convection section inlet varied with coal type. Chemical analysis of the size segregated particle samples show the trace elements, As, Pb, Zn and the major elements, Na and K to be enriched in the submicron aerosol. Auger depth profiles show these small particles to be comprised of a core enriched in Fe, Si, Ca and Mg and surface layers enriched in Na and K. These results point to a mechanism of homogeneous nucleation of low vapor pressure species followed by successive layering of progressively more volatile species. Volatile species are enriched in the submicron aerosol due to the large surface areas provided. Modeling efforts show that coagulation cannot be used solely to predict the PSD. Another mechanism, presumably surface area dependent growth (condensation) must be included.

29187 **(DOE/PC/70771—T3) Kinetics of nitrogen and sulfur reactions in combustion systems. Quarterly report No. 3.** (Energy and Environmental Research Corp., Irvine, CA (USA)). [1986]. Contract AC22-84PC70771. 120p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86009845.

Five aspects of the project are summarized in this report, including: (1) a review of what is known about low-temperature capture, (2) fuel nitrogen mechanisms during coal combustion, (3) SO-lime reactivity, (4) NO and HCN reactions on particulates, and (5) alternative SO_2 sorbents. The overall program is designed to support one goal: develop the crucial fundamental mechanistic and quantitative rate information on the chemistry of formulation and control of sulfur and nitrogen oxides as they pertain to pulverized coal fired systems. Because this area is so broad, the activity is focused somewhat on viable emerging control technologies. These technologies are specifically: NO/sub x/ control through staged combustion, reburning (fuel staging), and sorbents for NO/sub x/ capture; and SO/sub x/ control through calcium-based sorbents, low-temperature sorbents, and additives and preprocessing of calcium sorbents. However, it is expected that the fundamental mechanistic data that results from investigating issues related to the specific control technologies will have much broader long-range applications. In particular, new technologies may actually arise from the mechanistic kinetics information if they identify the major fundamental limitations to existing technologies. 48 refs.

29188 **(EPA—440/5-85-001) Perspectives on nonpoint source pollution - proceedings of a national conference.** (Environmental Protection Agency, Washington, DC (USA). Office of Water Regulations and Standards). 1985. 514p. (CONF-8505148—). US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC, USA.

From National conference on perspectives on nonpoint source pollution; Kansas City, MO, USA (19 May 1985).

Papers are presented on aspects of non-point source pollution under the following headings: legal aspects; state nonpoint source programs; institutional/financial aspects; ground water quality; lake quality; estuarine quality; streams and rivers; livestock waste management; economics of pollution; agricultural issues; urban issues (run-off, septic tanks); rural issues, including coal mining and abandoned land reclamation; land use issues; decision-making; data availability and needs; water quality criteria and standards; sources and fate's of pollutants; cross boundary pollution. Relevant papers have been abstracted separately.

29189 (EPA—440/5-85-001, pp 307-310) **Acid mine drainage: surface mine treatment and in-situ abatement technology.** Caruccio, F.T.; Geidel, G. 1985. US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC, USA. (CONF-8505148—).

From National conference on perspectives on nonpoint source pollution; Kansas City, MO, USA (19 May 1985).

Many treatment and control measures are available for the abatement of acid mine drainage from surface mines. The most appropriate technique for a particular mine site depends on the age of the site, the character and permeability of the mine surface, the degree of vegetation, the amount of calcareous material present in the overburden, the availability of a chosen ameliorant, site accessibility, and the source (physical and hydrologic) of the acidic seeps in the backfill or mine regime. The problem site must be explored by drilling; the hydrogeochemical system must be understood and the acid source identified before the treatment technology is implemented. (14 refs.)

29190 (EPA—440/5-85-001, pp 313) **Trends in post-mining land uses - are we doing our children justice?.** Eagleston, D. 1985. US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC, USA. (CONF-8505148—).

From National conference on perspectives on nonpoint source pollution; Kansas City, MO, USA (19 May 1985).

The US coal industry has reclaimed 75% of the land it has used from 1930 to 1980. Techniques used to control nonpoint source pollution include the use of surfactants, organic compost, water treatment flooding, clay caps, sediment ponds, etc. Soil and water conservation is very important in post-mining land uses, and must be built into long-term land management. (3 refs.)

29191 (EPA—440/5-85-001, pp 311-312) **Coal industry perspectives on nonpoint source pollution.** Leftwich, V.P. 1985. US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC, USA. (CONF-8505148—).

From National conference on perspectives on nonpoint source pollution; Kansas City, MO, USA (19 May 1985).

Active coal mines are virtually free of nonpoint source pollution; problems arise from sediment from abandoned surface mines and acid mine drainage from abandoned underground mines. Fees collected from coal mine operators form the primary source of revenue for the Abandoned Mine Reclamation Fund. Funds are advanced to coal-producing states for reclamation after approved reclamation and regulatory programs are in place. Guidelines for work are provided by the Office of Surface Mining. (6 refs.)

29192 (EPA—440/5-85-001, pp 314-316) **Factors and treatment of abandoned acid mine lands for controlling nonpoint source pollution.** Evangelou, V.P.; Thom, W.O. 1985. US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC, USA. (CONF-8505148—).

From National conference on perspectives on nonpoint source pollution; Kansas City, MO, USA (19 May 1985).

Mine spoil is generally chemically classified according to pH. However, this commonly misrepresents spoil material by assuming that pH is the main obstacle to reclamation. Abandoned acid mine spoils can be divided into four general chemical classifications based on electrical conductivity and pH of the spoil solution. This paper examines the following areas: 1) the factors which cause abandoned mine spoils to become acid and saline-gypsiferous; 2) the influences that acidity and salinity have on reclamation; 3) the proper frequency and chemical tests that need to be run to classify spoil; 4) ways to solve the problem of abandoned acid mine land reclamation. Fertility tests should be run only after the acid component has been identified, quantified and corrected. (7 refs.)

29193 (EPRI-CS—4404-Vol.4, pp 10.1-10.29) **Modeling of SO_2 removal in spray-dryer flue-gas desulfurization system.** Damle, A.S.; Sparks, L.E. (Research Triangle Institute, NC). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper presents a mathematical model of the SO_2 removal process in a spray-dryer flue-gas desulfurization system. Simultaneous evaporation of a slurry droplet and absorption/reaction of SO_2 in the droplet are described by the corresponding heat- and mass-transfer rate relations. Dissolution kinetics of lime particles within a slurry droplet is included in determining the overall SO_2 removal rate. The model identifies several parameters which need to be estimated or determined from experimental data. The model predictions of the effects of major parameters, such as approach to saturation and stoichiometric ratio on the SO_2 removal efficiency, follow observed trends. Comparison of the model predictions with one set of pilot-plant data shows very good agreement. 18 references, 8 figures, 1 table.

29194 (EPRI-CS—4404-Vol.4, pp 13.1-13.10) **Start-up and operating experience with a reverse air fabric filter as part of the University of Minnesota dry FGD system.** Buschmann, J.C.; Mills, J.; Soderberg, W. (FLAKT, Inc., Knoxville, TN). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A review of the start-up and operating experiences related to the Dry FGD System at the University of Minnesota is made with specific attention to the operation of the reverse air fabric filter. The system includes two separate gas trains, one connected to a stoker coal-fired boiler and the other to a pulverized coal-fired boiler, both using rotary atomization spray dryers operating with lime, once-through, for sulfur dioxide removal. Each system treats 120,000 ACFM flue gas. Operating parameters are reviewed and discussed with; (1) emphasis on the relative differences from conventional coal-fired operation, such as low temperature and pressure drop and ease of cleaning, and (2) enhancements derived from and contributing to the operation of the spray dryer, such as additional sulfur dioxide recovery. 5 figures, 1 table.

29195 (EPRI-CS—4404-Vol.4, pp 18.1-18.15) **Comparison of dry injection systems at normal and high flue gas temperatures.** Jensen, R.M.; Dunlop, W.; Lee, G.C.Y.; Folz, D. Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

At normal flue gas temperatures, the sulfur dioxide removal capability of a dry injection system using nahcolite as the reagent is limited to approximately 70%. The stoichiometry and capability of nahcolite to remove sulfur dioxide improve with increasing flue gas temperature. This paper compares technical, operating and economic considerations for dry injection with baghouse systems operating at normal (270°F) and high (550°F) flue gas temperatures. The high temperature system has regenerative air preheaters ahead of and after the baghouse. The hot system eliminates coldend problems for the regenerative air preheaters and provides greater heat recovery from the flue gas. High sulfur eastern and low sulfur western coals are burned in two 500-MW pulverized coal-fired power plants at Kenosha, Wisconsin. The study shows that the hot system is marginally competitive with the normal temperature dry injection system and with the spray dryer/baghouse system for low sulfur coal. For high sulfur coal, the hot system is competitive with the normal temperature dry injection system. 6 references, 7 figures.

29196 **(ICTIS/M—0187) Flue gas desulphurization and NO/sub x/ reduction.** Forck, B. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 22p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

A state-of-the-art review of flue gas desulfurization and NO/sub x/ reduction is given, mainly with reference to the Federal Republic of Germany. Legislation for air pollution control in the FRG is very strict. More than 80% of flue gas desulfurization units are lime or limestone to gypsum processes which show good efficiency and reliability, with the bonus that the waste products can be used in other industries. About 60 pilot plants for the SCR DENOX process of NO/sub x/ reduction are in operation, mainly adapting the Japanese selective catalytic reduction process to German boiler conditions. The economics of the life-time of catalysts are considered, and the environmental effects of waste product disposal. The disposal and utilization of fly ash is discussed, and the problems of retrofitting power plants. (22 refs.)

29197 **(ICTIS/M—0189) Experience from wet/dry desulfurization in Sweden.** Karlsson, H.T. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 12p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

This paper describes some of the experience from wet/dry desulfurization units in Sweden. The description includes data on performance as well as experience with equipment. At present, there are 5 units in operation at three plant locations. Within one year, 3 more units will be started up. The prospects to comply with the Swedish emission standards are discussed, and measured data of SO_2 removal are given. Design and operating parameters of major importance have been identified and are discussed in light of SO_2 removal and operating cost. Comprehensive measurements show

that the emission level of particulates is less than 1.3 mg/Nm³ on an average. The capital cost for a wet/dry system is 200-290 SEK/kW/sub t//sub h/. The operating cost for 1 per cent sulfur is 0.006 SEK/kWh/sub t//sub h/.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 29171, 29188, 29189, 29190, 29191, 29192, 29196, 29197, 29219, 29220, 29221, 29222, 29223, 29229, 29678, 29907

29198 **(DOE/FE/55014—T20) Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986.** (ANG Coal Gasification Co., Beulah, ND (USA)). Apr 1986. Contract FM02-82FE55014. 238p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE86010245.

Environmental monitoring, supplemental enviornmental programs, and quality assurance/quality control activities are covered in this quarterly report. Under the environmental monitoring program, the following topics are covered: permitting activities; ambient monitoring; plant discharge monitoring; pollution control unit emissions; surface mining and reclamation; environmental incident summary; and regulatory environmental inspections. The supplemental environmental program covers: performance survey; wastewater control and steam generation system; sulfur control; tar reinjection outage; gasifier effluent control system; toxicity screening study; toxicant characterization; data base management system; workplace characterization; fugitive emissions; epidemiology; atmospheric program; effects of cooling tower effluents on terrestrial ecosystems; and contingency program.

29199 **(EUR—9659-FR) Study of the conditions of formation and emission of trace element pollutants from the combustion of coal in industrial fires.** (Commission of the European Communities, Luxembourg). 1985. 126p. European Community Information Service, 2100 M St., NW, Suite 707, Washington, DC 20057.

Report on ECSC contract 7220-ED/301.

Studies have been undertaken on the distribution of trace elements, the anthracene, benzo-k-fluoranthene and benzo-a- pyrene contents and the effects of water leaching on combustion by-products. 26 elements showed certain mobility characteristics. All the mineral elements, apart from the manganese, zirconium and mercury, tend to concentrate in fine particles. The concentration of Fe, Mn and Mg are increased in fly ash with respect to coal mineral matter, whilst Si, Al, K and Ca are reduced, without apparent correlation with particle size. Mercury is almost totally released to the atmosphere in the gaseous phase. The emission factors for the polyaromatic hydrocarbons adsorbed by the fly ash could not be measured and were determined by excess. Coal and slag appeared non-leachable. Only some fractions of fly ash recovered from the final dedusters were subjected to leaching; this process proved to be of short duration and 90% of the extractable metals were contained in a volume of lixiviate slightly less than the volume of ash treated.

29200 **(STEV-FBA—85-15) Program for measuring the air pollution from burning peat fuels.** Bergstroem, J.; Bjoerner, B. (Statens Energiverk, Stockholm (Sweden)). Aug 1984. 42p. (In Swedish). (MKS—84-35). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751676.

Project Torv-Haelsa-Miloe.

The report describes the measurements which will be carried out at seven different Swedish boilers burning peat fuels. The measurements will show the difference in air pollution depending on the quality of the peat the fire technique and the equipment for flue gas cleaning.

29201 **Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines.** Rosbury, K.D.; Zimmer, R.A.; Rasmussen, J. (PEDCO. Environmental, Inc., Golden, CO). *Proceedings, Annual Meeting, Air Pollution Control Association;* 6: 16(1984). (CONF-840612—).

From Air Pollution Control Association annual meeting; San Francisco, CA, USA (25 Jun 1984).

Surface coal mines seeking a permit for a new mine or a major change to an existing mine plan must obtain a state permit. In response to permitting requirements, different sets of emission factors, dispersion models, and quantification techniques have been developed. Practices vary widely. To quantify the difference in emission/concentration results caused by various methods, three sets of emission factors and three dispersion models were used to predict air quality at a proposed mine in the Powder River Basin of Wyoming. The results indicate that the predicted air quality level can change by orders of magnitude depending on the quantification techniques used. Regulatory implications are set forth and research needs are identified.

0110 Reserves And Exploration

29202 **(DSIR-GD—202) Seismic surveys at Blackburn, Buller coal fields, New Zealand.** Paintin, J.K.; Stern, T.A. (Department of Scientific and Industrial Research, Wellington (New Zealand)). Jul 1985. 38p. Department of Scientific and Industrial Research, Wellington, New Zealand.

Seismic reflection and refraction methods were used to investigate the basement structure in the Blackburn-Seddonville area of the Buller coal fields. This is a remote area with the only vehicular access being to the Seddonville seismic line site. The other five seismic lines were conducted from a field camp that was transported from site to site by helicopter. The remoteness, combined with the pakihi swamp conditions and the thick bush, produced some special problems associated with the seismic survey. Near Seddonville, basement was found at a depth of 50-150 m beneath Kaiata Formation sediments - the Kaiata Formation being a Tertiary marine mudstone. Because of the shallowness of basement at this site a refraction analysis was adequate to define the depth and attitude of basement. At the other sites, where the basement surface is considerably deeper, reflections of varying quality were used to calculate the depth to basement. At the Base Swamp site good quality reflections gave a depth of 500 +/- 50 m to basement. Kaiata Formation sediments with a RMS velocity of 2.9 +/- 0.1 km/s overlie basement. At the Blackburn pakihi swamp site the reflection events were not as pronounced as those at Base swamp. Nevertheless an estimate of 190 +/- 20 m for depth to basement is made; this is in good agreement with the 180 m depth to altered granite basement found in drillhole 1353 that was put down subsequent to this survey. One site in the Ngakawau River bed and two in the St. George Stream bed were tried. Satisfactory reflections were obtained from the St. George Stream sites, however, at the Ngakawau River site no clear reflections could be confidently identified. (9 refs.)

29203 **(STEV-TORV—85-17) Variation of bulk density in Swedish peat bogs.** Staffansson, H. (Statens Energiverk, Stockholm (Sweden)). 1985. 49p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751673.

This project deals with the variation of bulk density in natural peat and methods to measure these variations. 338 samples of peat have been analysed, air photo interpretation has been tested as a method to detect areas of low bulk density and a Finnish radio wave probe for bulk density measurements in situ has been tested. The results show that bulk density variations are caused by the peat type and the humification degree on one hand and by hydrological factors on the other. The correlation between the peat type and the humification degree towards bulk density has been described in an earlier study (NE-1461-491). In this study the following results have been obtained according to relationship between the hydrological factors and the bulk density. - The wetness on the surface is a reflexion of the bulk density. A very wet surface indicates low bulk density almost to the mineral ground. -The bulk density variation grows when the difference in wetness on the surface grows. Peatland feed by overflowing water from the surroundings (fens and mixed mires) therefore has more varying bulk density conditions than peatland feed only by rain (bogs). - The bulk density content influences very strongly on the energy content. When comparing the two peatlands surveyed in this project, it has been found that on of them contents 40% less energy per sqm despite that the average thickness of the peat layer in the first one is 4.2 m and 3.8 m in the second one. - Airphoto interpretation is a very useful method to detect areas with low bulk density . - The Finnish radio wave

probe is a reliable and quick method to measure the bulk density of peat in situ.

0120 Mining

REFER ALSO TO CITATION(S) 29155, 29189, 29191, 29201

0130 Transport And Handling

REFER ALSO TO CITATION(S) 29179, 29180

29204 (DOE/PC/70796—8) Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986. Bodily, D.M. (Utah Univ., Salt Lake City (USA). Dept. of Fuels Engineering). 1986. Contract FG22-84PC70796. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009837.

The objective is to study the chemical and physical properties of coal macerals and whole coal which are important in the comminution of coal. Swelling studies of pyridine extracted and o-methylated coals were made in various solvents. For the pyridine extracted coal swelling increased in cyclohexane, toluene, acetone and methanol. Swelling in tetrahydrofuran remained constant and decreased in pyridine. For the 0-methylated coal pyridine also caused reduced swelling compared to the untreated coal. Tetrahydrofuran also caused reduced swelling while acetone, methanol and toluene caused enhanced swelling. Results of swelling are in agreement with the model preposed for coal swelling. Maceral separations of coal samples are being separated to provide sufficient sample for characterization studies on maceral fractions. Experiments have been initiated to study the grinding of coal in the presence of various solvents. 2 refs., 4 figs.

29205 (DOE/PC/70803—T6) Model for the flow of particulate matter with application to chutes. Quarterly technical report, December 1, 1985-February 28, 1986. Jackson, R. (Princeton Univ., NJ (USA). Dept. of Chemical Engineering). 1986. Contract FG22-84PC70803. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009465.

Preliminary theoretical results, which predict the flow behavior of particulate matter in chutes, are presented. The construction and future operation of fiber optic velocimetry probes are also discussed. 2 refs., 4 figs., 2 tabs.

29206 (DOE/PC/80517—T1) Improving the stability of coal slurries. Quarterly and half-yearly report, September 15-December 15, 1985 and September 15, 1985-March 15, 1986. Fogler, H.S. (Michigan Univ., Ann Arbor (USA). Dept. of Chemical Engineering). 1986. Contract FG22-85PC80517. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009580.

It is widely recognized that the economics as well as the technology of coal slurries can be gainfully modified through improved stability of coal slurries by using hydrocolloids. This report describes the start-up and the initial results of our study on the use of polysaccharides of plant and microbial origin as stabilizing agents of coal-water slurries. Settling rates of ultrafine coal and the final bed volumes have been used as criteria of stability. In order to understand the mechanism of stabilization, we have chosen monodisperse polystyrene latex particles in aqueous medium as the model system and also included in this report are the results of our turbidimetric analysis of particle stability in presence of hydrocolloids. On the basis of these early results, the future directions of our research are delineated. 13 refs., 5 figs., 2 tabs.

29207 (DOE/PC/80530—T2) Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986. Miller, J.D. (Utah Univ., Salt Lake City (USA). Dept. of Metallurgy). 31 Mar 1986. Contract FG22-85PC80530. 45p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009593.

Preliminary research has demonstrated the potential for the production of superclean coal by a carbon dioxide flotation technique. In this regard, a detailed research effort on the fundamentals of coal flotation by carbon dioxide was initiated in September 1985. The first quarter of research involved sample procurement and characterization. A listing of primary coal samples being used in this research project is presented in Table 1. Initial experiments with the low-volatile bituminous coal during the first quarter included measurements of CO_2 adsorption from the gas phase, determination of the hydrophobic character by bubble attachment-time measurements, and bench-scale flotation tests. These initial research efforts have been extended during the second and third quarter. Also, in addition to the status of these research activities, progress in other areas of the research program electrokinetic behavior of coal and, FTIR spectroscopy/thermochemistry, is reported. 25 refs., 22 figs., 15 tabs.

29208 (DOE/PC/81210—T10) Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986). Yang, D.C. (Michigan Technological Univ., Houghton (USA). Inst. of Materials Processing). 14 Apr 1986. Contract AC22-85PC81210. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009307.

The primary objective of the research effort is: to demonstrate the potential of the MTU flotation technology to produce a superclean coal allowing production of coal-based fuel at a cost which is less than 80% of the cost of a thermally equivalent petroleum-based fuel. Further objectives of the research are: to determine the efficiency of the separation achieved by the MTU flotation technology on coals of varying rank and origin, and to establish the effect of coal parameters such as ash content, ash mineralogy, and ash liberation size on the economics of superclean coal production. Task 1 "Selection and Procurement of Coal Samples," Task 2 "Sample Preparation and Chemical Analyses," and Task 3 "Fine Coal Washability" were scheduled to be completed during the reporting period. Task 4 "Mineralogical Analyses" and Task 5 "Flotation Screening Tests" were scheduled to be initiated but not completed. In the original plan, fifteen coals were to be studied in the initial phase of the project, consisting of bituminous coals from seven eastern, southern and midwestern states. The six coals recommended by the Energy Research Advisory Board (ERAB) were included. Due to nonreceipt and/or delay in receipt of the coal samples as planned, a new supply was sought and to the end of this reporting period fourteen selected coals have been received and processed for the work as proposed in the subsequent tasks. It is suggested the program proceed with only fourteen coals so far collected; eight of these coals will be selected for use in Tasks 4 and 5 as soon as all the washability studies of fine ground coals is completed. Preliminary flotation tests were conducted on three ERAB recommended coal samples which showed better washing characteristics than the rest. Among them the Pittsburgh No. 8 seam coal appeared to respond well, while Kentucky No. 9 and Indiana No. 6 behaved as if some oxidation had occurred. 5 refs., 2 tabs.

29209 (ETY—13/85) Elimination of quality fluctuations of milled peat in transportation phase and cost caused by these fluctuations. Kosunen, P.; Saarnio, A. (Finnish Energy Economy Association, Helsinki). 1985. 118p. (In Finnish). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751668.

This report on quality fluctuations of peat and the costs caused to consumers by elimination of these fluctuations has been made on the initiative of peat users. Peat users have had to receive peat the quality of which had fluctuated so greatly and so quickly that the peat handling system and firing devices of plants could not have eliminated these fluctuations. Quality fluctuations have caused additional costs and operational difficulties to these plants. This report describes technical and economical questions occurring when efforts are made to eliminate too great quality fluctuations of milled peat during loading and transportation. In addition, the report describes what costs quality fluctuations cause to plants and what alternatives there are to compensate them with equipment investment. The additional costs caused by peat quality fluctuations differ greatly from plant to plant and from unit to unit at one plant. Variations in costs are affected by quality fluctuations in the characteristics of delivered peat. Further, because of different technical solutions at plants, the critical limits of peat characteristics are not the same at every plant.

29210 (IEA/ICEAS—C3) Physical coal beneficiation and electricity costs. Mellanby-Lee, H. (International Energy Agency Coal Research, London (UK)). Feb 1986. 69p. NTIS (US Sales Only), PC A04/MF A01. File Number TI86901359.

This report is about the combined economics of coal preparation and electricity generation. It addresses the questions of how burning cleaner coals affects the overall costs at a power station and whether the costs of coal preparation are justified by these savings. These are complex questions because of: the different designs and environmental requirements of coal-fired power stations; the different qualities and cleanability of coals from different mines and coalfields; and the variety of established and proposed coal preparation processes and plant layouts. This report therefore reviews the considerable research that is being done worldwide on these questions. Some general conclusions are drawn at the end of the report but the overriding conclusion is that the combined economics of coal beneficiation and electricity generation depend on the particular circumstances and so each situation must be studied separately. Hence the purpose of this report is also to present relevant information on the costs and performances of existing and new coal beneficiation processes and coal-fired power stations, wherever this is available in the literature, to assist in such individual studies. The scope of this report is only physical beneficiation of bituminous coal and its effect on electricity costs. 23 refs., 33 figs., 38 tabs.

29211 (IEA/ICTIS/TR—31) Fundamentals of bulk solids flow. Wood, P.A. (International Energy Agency Coal Research, London (UK)). Jan 1986. 65p. NTIS (US Sales Only), PC A04/MF A01. File Number TI86901297.

Recent literature of relevance to the understanding of the bulk solids flow process is reviewed. The solid nature of coal dictates that it must be handled in a granular or powdered form. Consequently the successful handling of solids is an important factor governing the development of fossil energy components and systems, not only for coal but for other solid fossil fuels (oil shale and peat) and their waste products (ashes, slags, etc.). At a fundamental level however, the flow behaviour of these materials is poorly understood and an improved understanding has a potential to contribute to improvements in many areas of solid fossil fuel technology. The report commences with a basic introduction into the behaviour of bulk solids and indicates the various fundamental types of flow, flow patterns and flow problems that can be expected. There then follows an extensive review of the fundamental research presently being undertaken that can contribute to a clearer understanding of the mechanics of bulk solids flow and the parameters affecting that flow. The characteristics of individual particles (shape, size porosity, water adsorption and elasticity), of the particle assembly (particle size distribution, fabric, packing, cohesion and strength) and of the flow process (attrition, agglomeration, segregation, shear, dilation, fabric deformation, and particle collisions) are all considered in turn. It is concluded that a fundamental understanding of bulk solids flow is urgently needed and that the present level of understanding is inadequate. An active interchange between experimental, theoretical and computational research will increase this understanding and help to determine a reliable prediction mechanism. 369 refs., 6 figs., 2 tabs.

29212 (STEV-TORV—86-2) Pilot study in producing briquettes from peat. Norbaeck, K. (Statens Energiverk, Stockholm (Sweden)). Dec 1985. 90p. (In Swedish). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751690.

This project deals with the possibilities of making briquettes directly from fairly humid milled peat and drying of the briquettes in a vertical, continous shaft drier with heat pump and heat recovery of outlet air. Technical and economical studies of the complete system are presented. Tests have shown that briquettes with the dimension of 31 x 31 mm and still more sod peat with a diameter of 80 mm have problems to dry in their central parts. Wet milled peat in a several meter high vertical shaft will be so compressed that it is costly to press the drying air through it horizontally. If very humid peat, 55-65% moisture, should be briquetted, you have to dry it first. The thickness of the drying bed has to be small, 10-15 cm. Briquetting after drying gives hard briquettes. If the water contents of the peat is less than 55% you can make briquettes directly. A drying process with briquettes of 18-20 mm size will be without problems. A hardpressed material dries quicker than a loosepressed. If briquettes are to be dried the fraction of fine-grained material ought to be as small as possible. With a tight and well isolated construction the suggested drying method could give an electric consumption of 0.33 kWh/kg outdriven water. The tariff of electric power is low during the period 1 May - 30 September. This fact has been utilized in the economical calculation. When producing briquettes during 7 months a year continously the production will be 25.500 tons and the price 9.3 oere/kWh of briquettes with 20% moisture. The conclusion is that the principle of this project ought to be of great interest to further studies.

29213 (STEV-TORV—86-3) Mechanical dewatering of peat treated with chemicals. Final report. Joensson, B.; Petersson, E.; Lindman, B. (Statens Energiverk, Stockholm (Sweden)). 1986. 62p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751691.

The investigation shows: Small electrostatically stabilised peat particles are the main problem in mechanical dewatering of peat. These small particles can be bound to bigger peat pieces if the peat is treated with acid and cationic polyelectrolyte. This treatment increases the mechanical dewatering properties of the peat. The cost of the treatment is in 1985 about 50 SEK per ton dried peat. The amount of ashes per kg peat after mechanical dewatering is considered lower for the chemically treated peat than for the untreated. The chemically treated peat is also less sensitive for mechanical processing.

29214 Coal cleaning as an acid rain mitigation strategy: an in-depth examination. Garvey, D.B.; Doctor, R.D.; Anderson, J.L.; Livengood, C.D.; Farber, P.S. (Argonne National Lab., Argonne, IL). *Proceedings, Annual Meeting, Air Pollution Control Association;* **2**: 13(1984). (CONF-840612—).

From Air Pollution Control Association annual meeting; San Francisco, CA, USA (25 Jun 1984).

This study had as its primary focus the question of what SO_2 reductions could be obtained in the midwest by applying extensive physical coal cleaning to fuels being burned by major power plants. The issue of concern is strategies for achieving the level of SO_2 emission reductions (typically at least 50% from 1980 levels) proposed in acid rain legislation. The washabilities of the primary coals delivered to 20 plants in Illinois, Indiana and Ohio were examined in detail. Annual SO_2 emissions were calculated for each plant under 1980 operating conditions (capacity factor, heat rate, etc.) assuming 1980 fuel use (a combination of coals) and assuming only the major coal source was used (both raw ROM and cleaned to 80% weight recovery). Cleaning coal could result in potential reductions for individual plants from 10 to 50%. In comparison to 1980 emissions, however, these reductions ranged from 4% to 52%. The results of this study show that several specific power plants could achieve a 50% reduction in annual SO_2 emissions by switching to complete reliance on the main coal source and physically cleaning that coal. Thus, coal cleaning may be a cost-effective SO_2 control strategy for individual plants, but its usefulness as a mandatory acid rain mitigation strategy is limited.

0140 Combustion

REFER ALSO TO CITATION(S) 29199, 29678, 30208

29215 (DOE/CE/40543—1) Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses. Maxwell, B.P.; Gorrell, R.L.; Mustonen, J.P. (Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.). Aug 1984. Contract AC02-82CE40543. 434p. NTIS, PC A19/MF A01; 1; GPO Dep. File Number DE86009111.

The atmospheric fluid bed, air heater cycle offers the potential for a low cost, uncomplicated method for combustion of sulfur-bearing coal in an environmentally acceptable manner for industrial and small utility application. Since these cycles are relatively new, some of the basic configurational concepts have not yet been established. This DOE project, Generic Studies of Advanced Fluid Bed Air Heater Technology, is a multi task program to evaluate various

coal-fired, generic systems suitable for industrial cogeneration utilizing low-pressure, fluidized-bed technology to provide high efficiency energy systems. The program screens fixed as well as circulating systems with special emphasis on economic factors, risk identification, and ease of operation in industrial application. This Topical Report Number 1 presents the study results from Tasks 1 and 5. Task 1 developed a turbine exhaust gas blown, bubbling, fluid-bed, air heater design and identified the other plant equipment required for a coal fueled cogeneration plant. The design, performance and costs were compared with a fan-blown, bubbling-bed, AFBAH plant previously developed for the DOE Coal Combustor For Cogeneration, CCC-19, program. Design and performance information are contained in this report. Topical Report Number 6 contains the cost and economics data for all of the generic systems. Two important findings emerged as the study progressed, one rather early in the program. First, due to the natural of the fluid bed, air at about 80 inches of water is required for fluidization and combustion. Therefore, in the turbine blown case with the high back pressure requirement on the turbine, the gas turbine power output was only 81% of the fan blown system. Comparison of the cost figures between the two concepts produced the second important finding. The turbine blown system turned out to be only 2.3 percent less expensive than the fan blown concept. 133 figs., 25 tabs.

29216 **(DOE/CE/40543—6) Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems.** Maxwell, B.P.; Horazak, D.A. (Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.). [1986]. Contract AC02-82CE40543. 392p. NTIS, PC A17/MF A01; 1; GPO Dep. File Number DE86009116.

This report is an economic comparison of atmospheric fluid bed air heater cycles using three basic bed types (bubbling bed, circulating fluid bed, and supercharged fluid bed). Each bed type is configured both with and without a carbonizer and topping combustor. For the specified amounts of steam and air, the supercharged bed cycle with a carbonizer gives the highest return on investment (ROI). The recommended bed design for a cogeneration project seems to depend on the specifications for that project. The capital cost of a cogeneration plant that produces 210,000 lb/h of steam and 717,468 lb/h of heated air is between 83 million and 98 million 1982 dollars. The ROIs of these plants are between 13.7 and 18.2%, assuming no financing. At a value of steam of $6.22/1000 lbs and a value of air of $1.47/1000 lbs, cogeneration plants yield a greater ROI than separate air-heater and coal-stoker steam plants. The addition of a carbonizer to a cogeneration cycle requires more capital and yields a higher ROI, because the increased capital costs are offset by their increases in power generation. The ROI of a cogeneration plant varies with steam/power ratio if the plant it is allowed to produce any amount of steam or power, but ROI varies inversely with steam/power ratio in plants that must supply a specified amount of steam. The ROI rankings of the plants do not change with changes in operating characteristics, but several rankings change if the values of steam, air, or electric power are changed. 30 figs., 112 tabs.

29217 **(DOE/PC/70794—6) Effect of energy feedback mechanisms on the oxidation rate of pulverized coal. Quarterly report, December 1, 1985-February 28, 1986.** Haussmann, G.; Kruger, C.H. (Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.). Mar 1986. Contract FG22-84PC70794. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009598.

This research program has as its objective the understanding of energy feedback from burning volatiles surrounding individual pulverized coal particles as a fundamental mechanism of coal oxidation, as well as the assessment of this mechanism under various coal combustion environments. The effect of energy feedback mechanisms is expected to be observed both through a dependence on the bulk gas oxygen concentration, due to an enhancement of particle heating rates. Experimental results have indicated a weak increase in the overall pyrolysis yield with increasing oxygen concentration, although this result is subject to experimental error. The dominant effect of the bulk gas oxygen concentration is observed through the measured overall product formation rates. The effect of oxygen on the particle mass loss is much smaller than the effect of oxygen on the ultimate formation of combustion products (CO, CO_2 and H_2O). This observation has led to the development of a model to study the oxidation of pyrolysis products external to the coal particle. The current implementation of this model requires an initial condition, determined experimentally, from which diffusion-limited oxidation then determines the conversion rate of already released pyrolysis products to combustion products. Thus the model has a certain curve-fitting aspect, although it is valuable in validating the mechanism of diffusion-limited oxidation of pyrolyzed tars as a fundamental mechanism of pulverized coal combustion. Current efforts are aimed at using a heating-rate model to predict the pyrolysis yield and time history, thus allowing the construction of a complete model which predicts both the devolatilization yield and the ultimate combustion product formation rates. 8 refs., 7 figs.

29218 **(EUR—9404) Progress in circulating fluidized bed firing for steam generation and use of low value fuels and coals.** Duerrfeld, H.; Failing, K.H. (Commission of the European Communities, Luxembourg). 1984. 78p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751870.

With a view to making use of a widely spread fuel range for energy-conserving and environmentally harmless steam generation, a circulating fluidized bed firing system developed by STEINMUELLER for 1 MW thermal output has been installed. The enlargement of the cross section of the furnace in the lower part renders any fuel and additive conditioning unnecessary. All plant components have given proof of their functional capability. Widely differing coal grades could be burnt in this system with high efficiency and moderate pollutant emission. Within a period of 768 operating hours, the boiler load, primary/secondary air-ratio and calcium/sulphur ratio were experimentally varied. The results demonstrate that this advanced technology of circulating fluidized bed firing with integrated steam generation is economically attractive as well.

29219 **(ICTIS/M—0182) Assessment of atmospheric fluidised bed combustion techniques.** Takayasu, M.; Gregory, R.W. (International Energy Agency Coal Research, London (UK)). 1985. 17p. International Energy Agency Coal Research, London, England.

Atmospheric fluidised bed combustion has been commercialised for several years in specific locations and end uses. It is now at the position where it's expected promise over conventional solid fuel firing systems can be assessed. The claimed advantages are either being substantiated or modified by the practical experience to date. The current status of the technology has been summarised, including the problems encountered and their solutions. The trends for the future have been identified and it is anticipated the use of the technology will continue to grow. (8 refs.)

29220 **(ICTIS/M—0186) Modern pulverized coal combustion in Europe.** Berge, K. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 25p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

Pulverised coal combustion of coal has been an established technology for many years, and can be adopted to any steam cycle for power generation. Recent introduction of stricter environmental standards in most European countries has developed a somewhat confusing scene as to what is really the best available technology, which is demanded in most standards. Research and development work on P.F. combustion, especially on the possibilities of reducing the environmental impacts is ongoing in several European countries, and it is expected that new or refined techniques will be available within 2-3 years. This paper reviews boiler types, firing systems, milltypes and burners currently available, and assesses the relationships between coal quality characteristics and combustion equipment design.

29221 **(ICTIS/M—0190) Atmospheric FBC and CFBC - the American approach.** Bass, J.W. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 14p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

For the past several years, the electric utility industry has been developing AFBC. Considerable progress has been made at the Tennessee Valley Authority's (TVA) 20-MW AFBC Pilot Plant at Paducah, Kentucky. The utility industry is responding to test program successes and to agressive boiler vendor marketing with commitments to three demonstration projects: TVA is repowering a unit at the Shawnee Steam Plant in Kentucky with a new AFBC boiler; Northern States Power (NSP) is retrofitting a boiler at the Black Dog unit in Minnesota; and Colorado-Ute Electric Association is uprating a unit at the Nucla Station in Colorado by adding a new circulating AFBC boiler. This paper provides a summary of the 20-MW Pilot Plant test results and a description of the demonstrationproject at TVA. In addition, it presents a brief description of the demonstration projects at NSP and Colorado-Ute.

29222 **(ICTIS/M—0191) Atmospheric FBC and CFB: the European approach.** Highley, J. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 21p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

Atmospheric pressure FBC boilers provide an economic route to firing a range of solid fuels whilst controlling emissions of sulfur dioxide and nitrogen oxides. Costs are projected to be similar to those of conventional pulverised coal boilers without flue gas desulfurization. Fast circulating FBC boilers offer operational advantages over those using bubbling bed FBC, however they are more complex, and bubbling beds are preferred when a high grade fuel is available, and sorbent utilisation is not a major economic factor. Several FBC boilers are now in operation in Europe for power generation, mostly in combined heat and power systems. The AFBC air-heater combined cycle offers a similar cycle efficiency to pressurised FBC combined cycles. It involves a lower technical risk but does not have the advantage of compact size. PFBC is therefore expected to be preferred for the highest outputs. (12 refs.)

29223 **(ICTIS/M—0192) Pressurized-fluidized bed combustion (PFBC) - coal power for the future.** Almqvist, P.; Chambert, L.; Lindsjoe, L.; Jansson, S.A. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 12p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

Interest in fluidized-bed combustion first began in the 1960's and 1970's. Assessments in this paper are mainly based on the Swedish demonstration plant in Malmoe. Sulfur emissions can be maintained below 0.05 g/MJ of fuel energy by the addition of dolomite or limestone. Nitrogen oxide emissions are typically 0.10-0.15 g/MJ although these can be reduced. Continued test programmes will provide information on materials testing. The benefits of pressurized fluidized bed combustion include the high efficiency of the cycle due to the inclusion of a gas turbine in it, and the scope available for firing the plant with coal with high contents of ash and sulfur whilst keeping within environmental standards. Several full-scale plants are in the planning stages, including plants in the USA, Germany and Sweden. Final assessment of the economics of pressurized fluidized-bed combustion will depend on the performance of these.

29224 **Air blast type coal slurry fuel injector.** Phatak, R.G. (to Dept. of Energy). US Patent 4,569,484. 11 Feb 1986. Filed date 31 Aug 1984. vp.

This patent describes a fuel injector, particularly for injecting coal slurry fuel into an internal combustion engine. The injector consists of: 1.) a housing having a substantially central located opening extending through it. This opening has three different diameter sections; 2.) a needle assembly located in the opening of the housing. The housing includes three different diameter sections with a larger diameter section located between a smaller diameter section and an intermediate diameter section of the needle assembly; 3.) a nozzle assembly having a converging-diverging opening positioned at least partially in a first of the different diameter sections of the opening of the housing, an outer end of the intermediate diameter section of the needle assembly cooperating with the converging-diverging opening of the nozzle assembly to form a sealing surface inbetween; 4.) a device for retaining the nozzle assembly in the opening of the housing; 5.) a mechanism for applying pressure to the needle assembly. The pressure applying mechanism is movably located in a second of the different diameter sections of the opening of the housing; 6.) an inlet through which fuel and compressed air can be separately directed into the opening of the housing. This inlet is located in the first of the different diameter sections of the opening of the housing. This inlet is positioned around the intermediate diameter section of the needle assembly, for breaking and atomizing fuel directed into and through the opening of the housing.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 29197, 29210, 30012

29225 **(CONF-860286—1) Coal: evolving supply and demand in world seaborne steam coal trade.** Yancik, J. (International Trade Administration, Washington, DC (USA)). 1986. 23p. NTIS, PC A02/MF A01. File Number DE86901185.

From 6. international conference of the Resource Development Council for Alaska; Anchorage, AK, USA (12 Feb 1986).

This paper describes the evolution of world seaborne steam coal trade since 1975. It highlights current trends and the historic and present sources of supply and demand and discusses selected factors that may affect future world trade patterns. It concludes with a general discussion on the prospects for United States participation in the growing world markets for steam coal. Worldwide seaborne steam coal trade is linked very closely to the generation of electricity and industrial use of process heat in cement and other manufacturing plants. The main factors that influence this trade are: economic growth, electricity demand, indigenous coal production (and degree of protection from lower cost coal imports), and the delivered costs of coal relative to other substitutable fuels. It may be of interest to know how these factors have changed seaborne steam coal trade in the past twelve years. In 1970, the total world use of steam coal was about two billion short tons. International trade in steam coal was only 80 million tons or about 4% of the total. Seaborne trade accounted for about 30% of international trade, or about 25 million tons. In 1982, the latest year for which good statistics are available, total world use of steam coal was about 3.6 billion tons. Seaborne steam coal trade was 110 million tons which is about 3% of the total and 37% of the international trade. 11 figs., 2 tabs.

29226 **(DOE/EIA—0333(86)) Annual outlook for US coal 1986, with projections to 1995.** Paull, M.K.; Pantos, E. (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). 28 Apr 1986. 38p. NTIS, PC A03/MF A01 - GPO; GPO Dep. File Number DE86009888.

From 1985 to 1995, coal use in the United States is projected to exceed the historical level of coal use from the mid-1970's to the mid-1980's, growing faster than overall primary energy consumption. This expansion is projected because: domestic coal reserves are abundant; coal prices continue to be lower than the prices of oil and natural gas; domestic oil and natural gas reserves are being depleted more rapidly than coal reserves; and the availability and cost of imported oil are uncertain. This report elaborates on the EIA projection that coal use will increase, and discusses some of the factors and current issues that could affect this growth and the coal industry, including: environmental concerns, coal transportation systems, coal imports, and Federal coal leasing. In addition, sensitivity cases are presented in this report, based on assumptions of high economic growth and reduced capacity additions by electric utilities. A detailed discussion of the historical use of coal for coke production in the industrial sector is also presented her. The electric utility sector is projected to continue to be the major consumer of coal, accounting for 88% of total US coal consumption by 1995, up from 85% in 1985.

0160 Health And Safety

29227 Role of inhalation studies with animals in defining human health risks for vehicle and power plant emissions. McClellan, R.O. (Inhalation Toxicology Research Institute, Albuquerque, NM). *Environmental Health Perspectives;* 47: 283-292(1983). Contract AC04-76EV01013.

Automotive vehicles and power plants using fossil fuels emit a complex array of gases and particulate material. The physical and chemical characteristics of these emissions vary markedly between sources and comprise only a portion of the contributors to air pollution exposure of people. Further, it is well recognized that a single form of self-inflicted air pollution, cigarette smoking, is the dominant cause of air pollution-induced disease. These factors minimize our potential for developing an adequate understanding of the health effects of vehicle and power plant emissions by studying only people. The alternative is to use the human data to the extent feasible and complement it with information gained in studies with macromolecules, organelles, cells, tissues and whole animals. Within this context, this paper reviews the use of inhalation studies with animals for defining human health risks of airborne materials, especially particulate materials. The major areas covered are: the fate of inhaled materials, the pathogenesis of disease induced by inhaled materials and long-term animal studies to identify late-occurring effects. Emphasis is placed on the utility of studies in whole animals as integrative models in which the multiple processes such as xenobiotic metabolism, cell injury, repair, transformation and promotion under the influence of many host factors interact in a manner that may not be directly observed in isolated cells or tissues. 60 references, 3 figures, 1 table.

0170 Legislation And Regulations

REFER ALSO TO CITATION(S) 29188

29228 (DOE/RA/50179—T1) Economic assessment of effects of royalties, severance taxes, and diligent development requirements on coal production, prices, and consumer costs. Draft final report. (ICF, Inc., Washington, DC (USA)). Jun 1982. Contract AC01-81RA50179. 185p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86009315.

This report examines the economics of coal reserve evaluation, federal leasing policies, and severance taxes. Federal leasing policies and state severance taxes (in certain states) affect coal market prices, both directly for federal coal or coals mines in certain states and indirectly as a result of competitive coal markets where price changes in one region affect prices in other regions. The effect of these policies is not to capture fair market value (as it is for an individual owner) but rather to exploit a position of market power by driving up prices and creating monopoly rents.

29229 (ICTIS/M—0179) An overview of international NO/sub x/ control regulations. Dacey, P.W. (International Energy Agency Coal Research, London (UK)). 1985. 20p. (CONF-850505—). International Energy Agency Coal Research, London, England.

From Joint symposium on stationary combustion NO/sub x/ control; Boston, MA, USA (6 May 1985).

The pace of development of NO/sub x/ emission control regulations has increased rapidly in the past two years. This paper looks at some of the factors underlying this acceleration and the regulatory development in different countries. The experience in the Federal Republic of Germany, Japan and the USA has been influential in determining the timing and the form of regulations in other countries. Within a national framework, local agencies can significantly affect the stringency of regulations at individual sites. Using conversion factors for the different sets of units used allows inter- country comparisons to be made. In general the variation between countries in their treatment of emissions from different fuels is less significant than the absolute difference between emission levels for a given fuel. Treatment of particular plant sizes is generally in line with the overall stringency of a country's regulations. Potential future developments are reviewed. (7 refs.)

02 PETROLEUM

29230 (GB—11) Offshore oil and gas. A bibliography. (Department of Energy, Glasgow (UK)). 1985. 29p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86751889.

Guides to information sources and readily available books on economic, technical and legal aspects are listed with prices and publishers quoted. Directories for the U.K., North Sea and Europe, other countries and international directories are also listed. (UK).

0202 Geology And Exploration

29231 (DOE/ER/04392—8) Organic geochemistry of continental margin and deep ocean sediments. Final report. Hunt, J.; Farrington, J. (Woods Hole Oceanographic Institution, MA (USA)). 1986. Contract AC02-77ER04392. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010368.

The objective of this research was to investigate basic petroleum generation and migration processes in continental margin and slope sediments. Detailed depth profiles of both light hydrocarbons and high molecular weight organic matter were examined for 5 wells from the Texas Gulf Coast and 8 wells from the Alaskan North Slope. Major accomplishments of this study are: (1) development of sorbed light hydrocarbon (C1-C7) measurements as indicators of sediment petroleum maturation and migration processes; (2) development of pyrolysis methods for examination of sorbed and high molecular weight sediment organic matter as related to petroleum generation and migration; (3) determination of the bottom of the gas generation window in overmature sediments of the Alaskan North Slope; (4) determination that sediments generally considered as lean source rocks are undergoing both petroleum generation and primary migration in the Texas Gulf Coast sediments and must be considered as a potential source for some Gulf Coast oil; (5) determination that primary petroleum migration of C3+ hydrocarbons in fine-grained sediments does not become important until sediments enter the catagenic zone. (6) distinction of hydrocarbon generation from hydrocarbon migration via pyrolysis in several wells of the complex Alaskan North Slope region. 10 refs.

29232 Acoustic velocity measurements in materials using a regenerative method. Laine, E.F. (to Dept. of Energy). US Patent 4,566,084. 21 Jan 1986. Filed date 30 Sep 1982. vp.

This patent describes a method for measuring stress in the material of a volume of earth between first and second boreholes. This step includes the following: generating acoustic energy in the form of sinusoidal shear waves in the first borehole by means of a generator that converts electrical energy to acoustic energy. This acoustic energy is directed toward the second borehole; receiving the acoustic energy in the second borehole and converting the received energy into electrical signals; amplifying the electrical signals for transmission to the generator; the steps of generating, receiving the amplifying are performed inclusively in a closed loop that also includes the material; the amplification having sufficient regenerative gain to produce sustained oscillations in the closed loop which indicate the stress of the material of the volume of earth through which the acoustic energy is being transmitted; the generating, receiving and amplifying is done in the closed loop, the inherent noise in the closed loop providing initial signals to build sustained oscillations.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 29251

29233 (DOE/BC/10830—3) Evaluation of the Little Knife CO_2 minitest. Suffridge, F.E.; Dauben, D.L.; Pezzullo, J.A. (Keplinger Technology Consultants, Inc., Tulsa, OK (USA)). Apr 1986. Contract AC19-85BC10830. 88p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE86000279.

A joint DOE-Gulf Oil Corporation, nonproducing carbon dioxide minitest was conducted in the Little Knife Field in western

North Dakota. At the time of the project, the reservoir was undergoing primary depletion and had no secondary recovery operations underway. The five-acre inverted four-spot tested the applicability of a CO_2-alternating-with-water injection process to commercially displace oil in the nonflooded Mission Canyon Formation located in the Williston Basin. The nonproducing test was evaluated using time-lapse logging and fluid sampling to monitor fluid movement as injected CO_2 and water displaced 41° API oil in three observation wells which surrounded a central injector. Numerical simulation studies using the time-lapse logging data provided the basis for estimating pilot performance and evaluating a proposed expansion of the process to a 160-acre pattern. Gulf personnel are to be commended for designing and implementing a state-of-the-art, nonproducing pilot test of the CO_2 process. Results obtained in the pilot show an optimistic incremental recovery over waterflooding of 8.0 percent of the oil-in-place (OOIP) with an optimistic 1.0 STB of oil production estimated per 5.0 to 8.0 MSCF of injected CO_2 depending on exclusion or inclusion of Zone W. Assuming a more realistic 1.0 STB of oil recovered per 10.0 MSCF of injected CO_2, these results still encourage the commercial application of the process to the Little Knife Field upon location of a suitable CO_2 source. 34 refs., 17 figs., 13 tabs.

29234 **(DOE/MC/21136—6) Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985.** Heller, J.P.; Taber, J.J. (New Mexico Inst. of Mining and Technology, Socorro (USA). New Mexico Petroleum Recovery Research Center). Jun 1986. Contract FC21-84MC21136. 174p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE86000283.

This report gives detailed descriptions of progress in our research in three major areas of CO_2 flooding. Topic I concerns mixing and phase behavior of CO_2 and crude oils at reservoir conditions and methods of predicting pressures required for miscibility. A principal instrument of our experiments is the continuous multiple contact (CMC) apparatus, developed at the PRRC, that speeds acquisition of such data. A weighted parameter correlation formula has been developed to predict minimum miscibility pressure (MMP) from crude oil composition. Topic II examines the process of displacement in reservoir rock, concentrating on those aspects that influence flood efficiency and the extent of the mixing zone. This bears directly on the formation of the "developed miscibility" or Hutchinson-Braun transition zone in CO_2 output concentration curve from core floods, with the goal of scaling these results up to the reservoir-size process. In the opposite direction, work at a smaller scale has produced informative video records of displacements in micromodels. Topic III is concerned with mobility control in CO_2 floods. While the extent of loss of displacement efficiency due to the low viscosity of CO_2 is variable from field to field, the major goal of research in this area is to develop means for thickening CO_2 where mobility control is needed. Two methods are being studied. The first is "CO_2-foam" - the simultaneous injection of dense CO_2 and surfactant concentration, CO_2/water volume ratio and rock/brine/surfactant compatibilities. Our second effort is the development of special polymers to dissolve in the CO_2 and directly increase its viscosity. None are yet available, but significant progress is reported. 121 refs., 79 figs. 20 tabs.

29235 **(LBL—21111) Multiple-porosity method for simulation of naturally fractured petroleum reservoirs.** Wu, Y.S.; Pruess, K. (Lawrence Berkeley Lab., CA (USA)). Feb 1986. Contract AC03-76SF00098. 30p. (CONF-8604136—6). NTIS, PC A03/MF A01; GPO Dep. File Number DE86009907.

From Society of Petroleum Engineers regional meeting; Oakland, CA, USA (2 Apr 1986).

This paper describes the application of the method of "Multiple Interacting Continua" (MINC) to the simulation of oil recovery in naturally fractured reservoirs. A generalization of the double-porosity technique, the MINC-method permits a fully transient description of interporosity flow, using numerical methods. The method has been successfully applied in the past to geothermal reservoir and chemical transport problems. In this paper, we present examples to demonstrate the utility of the MINC-method for modeling oil recovery mechanisms and field applications in fractured reservoirs. Specifically, results for water imbibition in individual matrix blocks obtained with the MINC method are compared with results from the conventional double-porosity method and with calculations using a detailed discretization of matrix blocks. The MINC-calculations are found to be accurate to better than 1 percent at all times, while double-porosity results can have large errors for matrix blocks of low permeability or large size. In addition, the MINC-method is used to match published results for five-spot waterfloods, and to study the coning behavior of a single well in the north China oil field. All results show that the MINC-method provides accurate predictions of the behavior of naturally fractured reservoirs, while requiring only a modest increase in computation work in comparison to the double-porosity method. 21 refs., 15 figs., 5 tabs.

29236 **(NMERDI—2-73-4316) Improvement of CO_2 flood performance. Annual report.** Heller, J.P. (New Mexico Inst. of Mining and Technology, Socorro (USA). New Mexico Petroleum Recovery Research Center). Apr 1986. 244p. NTIS, PC A11/MF A01 - NMERDI, 117 Richmond Dr., NE, Albuquerque, NM 87106. File Number DE86901305.

This report gives detailed description of progress in our research into three major areas of CO_2 flooding. Topic I concerns mixing and phase behavior of CO_2 and crude oils at reservoir conditions and methods of predicting pressures required for miscibility. We present measurements and theoretical calculations, and outline shop and design work now being completed to increase the usefulness of the continuous multiple contact (CMC) apparatus. These improvements include on-line, high-pressure viscosity measurements and better temperature control. A weighted parameter correlation formula has been developed to predict minimum miscibility pressure (MMP) from crude oil composition. Topic II examines the process of displacement in reservoir rock, concentrating on those aspects that influence flood efficiency and the extent of the mixing zone. Mathematical and computer description is performed of the output concentration curve from core floods, with the goal of scaling these results up to the reservoir-size process. Work on a smaller scale has produced informative video records of displacement in micromodels. Topic III is concerned with mobility control in CO_2 floods. While the extent of loss of displacement efficiency due to the low viscosity of CO_2 is variable from field to field, the major goal of research in this area is to develop means for thickening CO_2 where mobility control is needed. Two methods are being studied. The first is "CO_2-foam" - the simultaneous injection of dense CO_2 and surfactant solution. The second method is the development of special polymers to dissolve in the CO_2 and directly increase its viscosity. 123 refs., 79 figs., 20 tabs.

0204 Processing

29237 (EPRI-AP—4431, pp 3.1-3.21) **Residual fuel oil markets: the source of changes in resid quality.** Mueller, H. (Electric Power Research Institute, Palo Alto, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

This paper is directed toward providing some background on changes in all aspects of the fuel oil market in order to give a perspective for the fuel oil combustion and handling problems and issues that are the principal focus of the workshop. One result of alterations in the refining industry has been a decline in the quality of residual oil produced by refiners. This plus the reduced ability to deal directly with the refiners to control or at least understand the quality characteristics of the resid that the utility industry is buying are real problems for the utilities. The ways in which utilities can deal with these changes are discussed in detail. 7 figures.

29238 **Synthetic fuel gas from petroleum coke-performance in an industrial gasifier.** Thimsen, D.; Pooler, A.R.; Pui, D.; Kittelson, D.; Liu, B.Y.H. (Black, Sivalls, and Bryson, Inc., Twin Cities Operatons, Minneapolis, MN). pp 167-174 of Synfuels and coal energy symposium - 1985. DICKS, J.B. New York, NY; American Society of Mechanical Engineers (1985). (CONF-850201—). Contract AI21-77ET10205.

From ASME energy-sources technology conference and exhibition; Dallas, TX, USA (17 Feb 1985).

Petroleum coke, a residue of petroleum refinery operations, is produced in North America at a rate in excess of 15 million tons per year with production increasing each year. This represents approximately 70% of worldwide production. The petroleum coke is characterized as a low ash, high heating value, low volatile matter fuel with sulfur content dependent on the sulfur content of the crude oil from which it is produced. The primary market for this material is as a coal supplement to raise the heating value of the coal. In June 1983, 267 tons of delayed petroleum coke were gasified in an air-blown, fixed bed coal gasifier as part of an on-going industrial coal gasification test program sponsored by the U. S. Department of Energy, the U.S. Bureau of Mines and industrial cooperators. Two size distributions of double screened petroleum coke were tested during a total of 17 days of operation. The gasification test allowed measurement of fuel gas quality and conversion efficiency as a function of load and steam/air ratio in the gasifier blast. Overall thermal efficiencies for production of hot, raw gas ranged from 85% to 90%. Higher heating value of the dry gas ranged from 133 to 140 BTU/SCF. Maximum throughput observed was 54 lb/hr/sq ft grate area. Maximum throughput during this test was limited by the primary air fan capacity and may be greater than that indicated. The result of the test indicate that petroleum coke is an excellent fixed bed gasifier feedstock. The negligible ash content provides for very stable and labor-free operations. The primary technical (and perhaps economic) drawback is high sulfur emissions when a high sulfur petroleum coke is used. Preliminary economic analyses indicate that the fuel gas is an attractive replacement for natural gas or oil.

0205 Products And By-products

REFER ALSO TO CITATION(S) 29238, 29674, 29683

29239 (EPRI-AP—4431, pp 3.25-3.44) **Controlling compatibility of residual fuel oils.** Griffith, M.G.; Siegmund, C.W. (Exxon Research and Engineering Co., Linden, NJ). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

A method is presented for predicting compatibility based on the properties of blend components. A fuel blend is considered to be a solution consisting of asphaltenes as the solute and the remainder of the fuel as the solvent. Asphaltenes will precipitate if there is insufficient solvency relative to the solvency requirement of the asphaltenes. Fuel solvency is measured by Bureau of Mines Correlation Index (BMCI), which is related to aromatics content. Paraffinic components have low BMCI while cracked distillates and resids have higher BMCI. Solvency requirement is measured by the Toluene Equivalence (TE) test, which expresses the minimum concentration of toluene in heptane required to completely dissolve a resid. Cracked resids have high TE's compared to virgin resids. Asphaltenes will remain in solution as long as BMCI is sufficiently greater than TE. This prediction method explains known compatibility phenomena, allows control of compatibility of blends based on inspections on the components, and reveals sensible ways of avoiding potential problems. It is explained how compatibility depends on the relative concentration of cracked vs. virgin components, and what difference there is for the virgin component being a distillate or another residual fuel. These considerations are important not only in blending fuels for viscosity reduction, but also for estimating the consequences of mixing different fuels in tankage. 4 references, 6 figures, 1 table.

29240 (EPRI-AP—4431, pp 3.101-3.114) **Experience in switching to heavier fuel oils.** Bonett, D. (Consolidated Edison Co. of New York, NY). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

Results of a field test conducted as part of an engineering study to evaluate the handling capability of the equipment associated with Con Edison's oil burning plants, the environmental impacts, and the efficiency changes when using different fuels are presented. The fuels used had a pour point of 110°F instead of 100°F and a viscosity of 260 SSF rather than 150 at 122°F. The study indicated that Con Edison can switch to a heavier fuel oil, switching one unit at a time in an orderly fashion. 2 figures, 2 tables.

29241 (EPRI-AP—4431, pp 3.199-3.204) **Overview of EPRI residual fuel oil combustion project plans.** Schreiber, H. (Electric Power Research Institute, Palo Alto, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

An overview of a three-phase comprehensive program to address the problems that are being encountered by oil firing utilities due to the variability of residual fuel oils is presented. In phase 1, several fuels that have caused operating problems in boilers will be identified and characterized by comprehensive laboratory analysis. The laboratory scale work will be coordinated with pilot plant scale tests using a single fuel size utility type burner (50-100 MBTU/h) firing into a test stand tunnel in phase 2. The third phase of the work will involve field testing of fuels having characteristics identified earlier as being causative factors in boiler combustion difficulties.

29242 **Process for preparing 2,3 dihydroxybenzoic acid amides of tetraaraalkanes and cycloalkanes.** Weit, F. L.; Raymond, K. N. (to The United States of America as represented by the United States Department of Energy). US Patent 4,543,213. 24 Sep 1985. Filed date 7 Aug 1979. vp. PAT-APPL-64593.

The present compounds are useful as specific sequestering agents for actinide ions. Also described is a method for the 2,3-dihydroxybenzamidation of azaalkanes.

0206 Health And Safety

REFER ALSO TO CITATION(S) 29227

29243 **(IKE—2-70) Liquefied gases risk assessment. Part 1: LPG land transportation and storage safety. Part 2: Potential hazards of low-temperature LPG in contact with warmer liquids, e.g. water.** Unger, H.; Froehlich, G. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme; Stuttgart Univ. (Germany, F.R.). Abt. Reaktorsicherheit und Umwelt). Dec 1984. 91p. (In German). (CONF-8410402—Exc.). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751722.

From Expert meeting on LPG storage: hazards of LPG storage and transport; Essen, F.R. Germany (29 Oct 1984).

The publication abstracted contains an analytical survey of fatal accidents due to leaking liquefied petroleum gases (LPG). The report is based on land transport accidents which happened between 1971 and 1979 and involved tank cars, trucks and pipelines. Moreover, reference is made to accidents in stores as well as to loading and unloading accidents. The average annual U.S. accident death rate is 6. It refers to unconcerned persons. The paper describes the reciprocal action between liquefied gases and liquids (e.g. water). Emphasis is on entrapment explosion mechanisms, thermodynamic interaction and thermal detonation. Steam explosions such as these are characterized by rapid heat transmission processes between liquids. (DG).

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 29938

29244 **(DOE/EI/10464—T2) Development of financial statements for the domestic petroleum industry, 1977.** (ICF, Inc., Washington, DC (USA)). Oct 1980. Contract AC01-79EI10464. 45p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010345.

This report presents domestic petroleum industry financial statements for 1977. These income statements and balance sheets

represent the culmination of an extensive effort to identify, compile and rationalize diverse data sources. As such, this report should be viewed as a follow-on to our earlier ICF report, Interim Report on Pro Forms Development, which presented representative financial statements for the domestic petroleum industry. Chapter I of this report examines the composition and size of each domestic petroleum industry sector sample and briefly describes the methodology used to derive the representative financial statements for each sector. Chapter II outlines the methodology and specific calculations required to rationalize the representative data into the comprehensive sector-specific financial statements. Finally, an Appendix describes the scope of the major data sources in terms of their financial item detail and coverage of the industry.

29245 **(DOE/EIA—0185(85)) Costs and indices for domestic oil and gas field equipment and production operations, 1985.** Funk, V.T.; Anderson, T.C. (USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas). 7 Apr 1986. 174p. NTIS, PC A08/MF A01; 1 - GPO; GPO Dep. File Number DE86009120.

This report presents estimated costs and indices for domestic oil and gas field equipment and production operations for 1985. The costs of all equipment and services were those in effect during the month of June for each year. The sums (aggregates) of the costs for the hypothetical leases by area, depth, and/or production rate were averaged and indexed to provide a general measure of the increased or decreased costs from year to year for lease equipment and operations. These general measures may not represent industry-wide cost changes because of varying well mixes. Summary tables are included in the text of the report and detailed tables are included in the Appendices.

29246 **(DOE/EIA—0380(86/02)) Petroleum marketing monthly, February 1986.** (USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas). 30 Apr 1986. 157p. NTIS, PC A08/MF A01; 1 - GPO; GPO Dep. File Number DE86010273.

Information and statistical data about a variety of crude oils and refined petroleum products are given. The publication provides crude oil cost statistics and refined petroleum products sales statistics for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase price, the f.o.b. and landed cost of imported crude oil, and the refiners' acquisition cost of crude oil. Sales data for motor gasoline, distillates, residuals, aviation fuels, kerosene, and propane are presented.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 29684, 30527, 30575, 30591, 30624

29247 **Microbial biosurfactant - physiology, biochemistry, and applications.** Finnerty, W.R.; Singer, M.E. (Univ. of Georgia, Athens). *Developments in Industrial Microbiology;* **25**: No. 2, 31-40(1984). Contract AS19-81BC10507.

A bacterial soil isolate H-13A was isolated which produces a cellular and extra-cellular glycolipid surfactant. Glycolipid is synthesized only during growth on n-alkanes (C12 → C20). The glycolipid contains disaccharide, glycerol, amino sugar, N-acylated, and O-acylated fatty acids. Cellular glycolipid is characterized by saturated fatty acids and unsaturated fatty acids; whereas extracellular glycolipid contains saturated fatty acids and 2-hydroxy fatty acids. The hexadecane-derived glycolipid exhibits an interfacial-tension value of 2.0×10^{-2} dynes/cm at an effective alkane carbon number equivalent to decane. Addition of pentanol as a cosurfactant reduces the interfacial tension to 6.0×10^{-5} dynes/cm with an effective alkane carbon number equivalent to undecane. The glycolipid is effective in the reduction of heavy crude-oil viscosity by formation of stable oil-in-water emulsions with improved rheological properties. Growth of H-13A on Monagas crude ion results in a 95% reduction in oil viscosity. This glycolipid biosurfactant exhibits applicability to the transport, pipelining, processing, and recovery of heavy crude oils. 18 references, 1 figure, 4 tables.

0220 Transport, Pipelines, And Handling

REFER ALSO TO CITATION(S) 29243

29248 **Rolling cuff flexible bellows.** Lambert, D. R. (to The United States of America as represented by the United States Department of Energy). US Patent 4,540,203. 10 Sep 1985. Filed date 27 Sep 1982. vp.

PAT-APPL-425139.

A flexible connector apparatus used to join two stiff non-deformable members, such as piping. The apparatus is provided with one or more flexible sections or assemblies each utilizing a bellows of a rolling cuff type connected between two ridge members, with the bellows being supported by a back-up ring, such that only the curved end sections of the bellows are unsupported. Thus, the bellows can be considered as being of a tube-shaped configuration and thus have high pressure resistance. The components of the flexible apparatus are sealed or welded one to another such that it is fluid tight.

0230 Properties

REFER ALSO TO CITATION(S) 29237, 29239, 29684

29249 **Method for controlling the viscosity of siloxane oils.** Carey, A. A.; Shor, J. T. (to The United States of America as represented by the United States Department of Energy). US Patent 4,540,503. 10 Sep 1985. Filed date 12 Sep 1984. vp.

PAT-APPL-649623.

This invention relates to a method of controlling the viscosity of siloxane oils in the presence of lead by adding a small amount of a dione such as p-benzoquinone or 2,3-butanedione.

0240 Storage

REFER ALSO TO CITATION(S) 29243

03 NATURAL GAS

REFER ALSO TO CITATION(S) 29230

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 29232

29250 **(UCRL—94075) In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli.** Lin, W.; Heuze, F.E. (Lawrence Livermore National Lab., CA (USA)). Feb 1986. Contract W-7405-ENG-48. 10p. (CONF-860609—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86006916.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

This paper focuses on tests performed on sandstones and shales from four gas wells in the Mesaverde formation. A previous document showed a comparison of the static and dynamic laboratory moduli. This publication describes how field velocity logs were used to derive field dynamic moduli. A 3-way comparison was then performed for these stiffness properties; the results show no agreement between the three sets of values. Differences between dynamic stiffness coefficients from the field and the laboratory exceed 200%; differences between static and dynamic coefficients range up to 600%. In turn, this indicates that a reliable method of estimating mechanical rock properties for hydraulic fracturing design has not been established, and that such a task should be pursued. 23 refs., 6 figs., 3 tabs.

0308 Environmental Aspects

REFER ALSO TO CITATION(S) 30527, 30542

0309 Artificial Stimulation

REFER ALSO TO CITATION(S) 29250

29251 (SAND—85-2075C) Effects of wellbore liquids in propellant-based fracturing. Cuderman, J.F. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 8p. (CONF-860609—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007832.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

In situ experiments at the Department of Energy's Nevada Test Site (NTS) have extended the technology of propellant-based fracturing to include liquid-filled, uncased boreholes. Previous work had developed the technology for liquid-free, uncased wellbores. Test results show tha fracturing behavior is considerably more complex in liquid-filled boreholes than in the liquid-free case. Compared to liquid-free boreholes, liquid-filled boreholes have faster pressure risetimes and lower peak pressures, large hydraulic-type fractures propagating several meters beyond the end of the test zone, numerous oscillations in the pressure history, and variable types of fracturing within a single test region. Multiple fracturing is initiated in the wellbore of a fluid-filled borehole when the proper propellant mixture is used but, unlike fluid-free wellbores where up to eight fractures propagate, only one to three hydraulic- and/or shear-type fractures propagate. Hydrodynamic effects involving liquid compression during borehole pressurization appear to be responsible for the differing phenomena observed in fluid-filled boreholes. 7 refs., 8 figs., 2 tabs.

29252 (UCRL—93429) Quasi-static and dynamic arbitrary fracture propagation in jointed rock. Shaffer, R.J.; Nilson, R.N.; Heuze, F.E.; Swift, R.P. (Lawrence Livermore National Lab., CA (USA); S-Cubed, La Jolla, CA (USA)). Mar 1986. Contract W-7405-ENG-48. 7p. (CONF-860609—10). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008029.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

As part of the Unconventional Gas Program at the Lawrence Livermore National Laboratory, we are developing a model that allows for time-dependent tracking of the fluid front and flow pressures during the quasi-static, or dynamic fracturing of jointed rocks. Application of the model is directed towards both short fast fractures (as in tailored pulse loading) and long hydraulically induced fractures (massive hydraulic fracturing). The thrust of this research is to determine crack extension characteristics due to specific joint systems and fluid properties and to correlate pumping records with crack behavior in jointed systems. 8 refs., 5 figs., 2 tabs.

0320 Transport, Pipelines, And Handling

REFER ALSO TO CITATION(S) 29248

29253 (PTB-Me—58) Problems of large-volume gas flow measurements in the high and low pressure range. Proceedings. Narjes, L. (ed.). (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Abt. Mechanik). Jul 1985. 457p. (In German). (CONF-840197—). NTIS (US Sales Only), PC A20/MF A01. File Number DE86751708.

From 45. PTB seminar on problems of metering large gas volume flows in the high and low pressure range; Braunschweig, F.R. Germany (24 Jan 1984).

The most common methods for precision measurement of large-volume gas flows were compared at this seminar, and criteria for their different aplications were established. The seminar comprised the two sections 'Fundamentals fo metrology' and 'Industrial metrology and standard measuring instruments'. 22 papers were read. The following subjects were covered: A model of universally applicable criteria of evaluation based on fluid flow physics and taking account of operational aspects; use of the laser doppler anemometer in fluctuating gas flows; problems of density measurement and differential pressure measurement in natural gas flows; successful industrial application of turbine meters as standard meters; state of the art of turbulent flow meters; bells as standard gas meters; development of a charging technique to determine steady-state mass flow of gases in the high and low pressure range. (orig./DG).

04 OIL SHALES AND TAR SANDS

29254 Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). 354p. (CONF-8504101—). Colorado School of Mines Press, Publications Center, Golden, CO 80401.

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

This book presents the papers given at a symposium on oil shales. Topics considered at the symposium included geochemical surveys, geologic surveys, hydrology, oil shale mining, explosive fracturing, in-situ retorting, pyrolysis, retorts, research programs, synthetic fuels, China's oil shale industry, nitric oxide emissions, solid wastes, spent shales, and personnel management.

29255 EPA oil shale research activities. Bates, E.R. (US Environmental Protection Agency, Cincinnati, OH). pp 240-247 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

In response to the slowdown in oil shale development activity and general budget reductions, EPA has substantially cut back its oil shale research activities. However, several new projects are going forward which should not only be of interest to developers and researchers but also support future regulatory and permitting decisions by the Agency. New activities include evaluation of the potential for using combusted Green River shale to adsorb SO_2 as a primary sulfur control technology, preparation of a new Pollution Control Technical Manual on the Unishale B and C processes, and preparation of two state-of-the-art reports addressing planning and designs for retorted oil shale disposal and control of gaseous emissions from retorting. Activities which have been ongoing for some time include investigation of leaching and hydraulic properties of retorted shales including co-disposal of waste-water and shale, field testing of Stretford and caustic scrubbing for control of H_2S in shale offgas, a compilation of available information on solid waste characteristics for various retorting technologies, and assessment of retorted shale as a liner for retorted shale disposal sites. A selected list of published EPA reports on oil shale is provided, including recently released reports on assessment of the auto-oxidation potential of retorted and raw oil shales, field evaluation of leachates from raw mined oil shales, and leaching and hydraulic properties of selected retorted shales.

0401 Reserves And Exploration

REFER ALSO TO CITATION(S) 29939

0402 Site Geology And Hydrology

REFER ALSO TO CITATION(S) 29276

29256 Hydrogeologic characterization of the Colony Shale Oil Project Area. Day, M.J.; Perry, H.A. (Applied Hydrology Associates, Gillette, WY). pp 58-67 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Extensive geologic and hydrogeologic studies were conducted at the Colony Shale Oil Project site during the period 1980 to 1982. Geologic studies included stratigraphic, lithologic and geo-

technical logging of 18 coreholes, extensive mapping of structural features, remote sensing analysis and a detailed interpretation of geologic and geotechnical data. Hydrogeologic studies involved the completion, testing and monitoring of 27 bedrock wells in 10 locations and 19 shallow bedrock and alluvial piezometers; infiltration testing and seismic refraction surveys. The programs were designed to gain information on both lateral and vertical hydrogeologic characteristics of the bedrock units, and the recharge potential of the surficial bedrock in the project area.

29257 **Oil shale grade variability in close-spaced core holes in the Mahogany zone of the Colony Shale Oil Project area.** Perry, H.A.; Brechtel, C.E.; Hardy, M.P. (Exxon Co., USA, Grand Junction, CO). pp 1-8 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Fourteen close-spaced core holes were drilled through the Mahogany mine zone on the Colony property to evaluate lateral oil shale grade variability. Lateral grade variation was evaluated using horizontal variograms, developed for the average grade of the 60 ft Mahogany mine zone, the 25 ft upper heading and 35 ft lower bench. Variograms for the close-spaced holes did not indicate any reduction from the overall sample variance at the minimum spacing of 90 feet. However, the variance of the close-spaced holes as a group, is roughly one-half the overall variance of all 59 holes located throughout the property for the 60 ft zone and the lower bench. The variance of the close-spaced holes is similar to the overall variance of all holes for the upper heading. The variograms indicated that predicting retort-feed-grade variability with vertical boreholes drilled from the surface would be impractical. The evaluation of the grade of daily or monthly production would require the development of some type of in-mine sampling program. The shape of the variograms for all the drilling data was not consistent with the variogram models commonly employed in geostatistics. This was probably due to the relatively small number of holes that are available for the analysis, especially at close and intermediate spacings. Thickening and thinning of stratigraphic subzones in the Mahogany Mine Zone was investigated in an attempt to identify the mechanism for lateral grade variability. Correlations between average grade of the subzones and thickness were poor, indicating that this was not a primary reason for lateral grade variation.

29258 **Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado.** Daub, G.J.; Weston, L.K.; Rosar, E.C. (Daub & Associates, Consulting Geologists, 1980 South Broadway, Grand Junction, CO). pp 21-46 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Core from two of eight exploration holes, MMC-IRI-3 and 5, were analyzed to determine lithologic variability and rock quality of the Uinta Formation and the Parachute Creek Member of the Green River Formation beneath four Federal Sodium Leases, currently held by Industrial Resources, Incorporated, that cover 8,358 acres. In addition, hydrologic data collected from two of three air-rotary holes, MMC-IRI-7 and 8, were also analyzed and correlated with lithologic and rock quality information. This study shows that stratigraphic and fracture zone correlation exists between the two core holes. In addition, the occurrence and movement of ground water beneath the site is strongly influenced by the presence and distribution of fractures and dissolution features. Both the percent Rock Quality Designation (RQD) data and the detailed rock quality information exemplify the incompetent nature of the rock within the Parachute Creek Member. Conventional underground mining of the oil shale in the Leached zone appears to be impractical and uneconomic. However, the Saline zone rocks are quite conducive to solution and conventional underground mining techniques.

29259 **Saline dissolution collapse in the Piceance Creek Basin.** Galliver, T.W. (J.F.T. Agapito & Associates, Inc., Grand Junction, CO). pp 47-57 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Dissolution of salts in the Piceance Creek Basin oil shales has lead to considerable collapse. Fracture systems affecting dissolution at depth show visible lineaments. Remote sensing, hand in hand with drill hole data, allows interpretation of solution collapse and modeling of rock quality and hydrology in the leached zone and overlying strata. In this study, video-enhanced Landsat imagery is used to relate relic salt bulges in a single zone to lineaments in the cental basin. Fractures indicated by linear gulches and lineaments bounding salt in bulges are suggested to have localized solution collapse.

0403 Drilling, Fracturing, And Mining

29260 **Dust and pressure generated during commercial oil shale mine blasting.** Weiss, E.S.; Cashdollar, K.L.; Sapko, M.J. (US Dept. of the Interior, Bureau of Mines, Pittsburgh Res. Center, P.O. Box 18070, Pittsburgh, PA). pp 68-76 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The Bureau of Mines, in support of its long-term study of the explosion and fire hazards of oil shale mining, participated in a joint project with Exxon Company involving the production-scale blasting of oil shale at the Colony Mine in Colorado. Data collected during three blast tests included overpressures and airborne dust concentrations generated during the blasts and also post-blast, floor dust loadings. Two movie cameras were used to observe the third blasting test. One observed the face, and the second observed perpendicular to the entry at a distance of 40 m (125 ft) from the face. The maximum overpressures were a few tenths of an atmosphere or, equivalently, a few psi. The post-blast floor dust loadings at positions 40 to 160 m (130 to 520 ft) from the face were well below the concentrations required to propagate explosions if the dust were uniformly dispersed throughout the cross section. Observations with the movie cameras and an optical dust probe showed that there may have been transient localized regions of much higher dust concentration during the blasting.

29261 **Mining strategy effects on oil shale profitability.** Studebaker, I.C. (Mining Eng. Dept., Montana Coll. of Mineral Science and Tech., Butte, MT 59701). pp 77-82 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Oil shale pojects, for the most part, have ignored the mining efficiency effects on the design of the mining operations. The potential mine design is often based on artificial constraints imposed by the plant size or other requirements such as the 50,000 barrel per day "commercial sized operation." The normal rationalization is that for a large size mine, the efficiency of scale is already exceeded and by tacit assumption no attention need be paid to an optimum level of operations. Fundamental relationships are examined to quantify and define the effects of various factors in the mining design parameters of the mining operations. These parameters include: the opening height and width relationships for drifts; the effect of mine design on mine support requirements; the effect of mining practice (blasting) on mine support requirements; and an assessment is made of the efficiency of labor as an operating parameter. Conclusions and results presented demonstrate the complex relationship of the parameters included in mining strategy and relate them to the economics of an overall project.

29262 **Evaluation of blast designs for in situ oil shale retorting.** Gorham-Bergeron, E.; Kuszmaul, J.S. (Sandia National Lab., In Situ Tech. Div., Albuquerque, NM 87185). pp 101-108 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Reliable analytical methods for predicting in situ rubble bed characteristics resulting from a particular blast design have not yet been developed. Nevertheless, the computational tools which are being prepared for use in such a task have reached the stage where the capability exists for making predictions. Although rock motion analysis is in its infancy, a sequential fracture-motion analysis can be used to identify potential problem areas for blast designs. Explosive dead-pressing and fracturing in undetonated decks are examples. This paper describes the results of the coordinated use of DYNA2D (Taylor, 1984) (a finite element code used to calculate explosive behavior, shock wave propagation and rock fracturing) and CAROM, a recently developed, fast-running, rock motion code (Gorham-Bergeron and Kuszmaul, 1985) based on principles similar to those of an earlier code BUMP (Schamaun, 1983). An integrated analysis is presented of the fracturing and motion of rock fragments that results from two designs that differ only in detonation timing delays between decks and is typical of those under consideration for in situ oil shale retorting. The computational results indicate that for the retort geometry chosen, varying the blast timing between successive decks is not likely to have a major impact on the characteristics of the final rubble pile. Intra-deck timing delays may be important but were not investigated.

29263 **Limitations of commercial explosives and blasting caps and their effect on in situ blast design.** Britton, K. pp 109-122 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The limitations of presently available explosives products form a constraint for the in situ blast designer. This is generally unrecognized, but is a matter of some seriousness. The ultimate effects on blast design are almost always significant, often profound, and not infrequently found to be the limiting factor regarding practicability. The designer may be denied the ability to optimize because of the need to make substantial provision to compensate for failure or substandard performance, technically innapropriate product often being traded for enhanced reliability. More seriously, constraints render theoretically desirable geometries or timings impractical. This may gravely compromise a process, e.g. by limiting the resource applicability, or, if more tolerant designs prove ineffective, result in economic or technical failure. Initiating systems are discussed in depth, illustrated by experience from the Geokinetics Lofreco Process, and using data from retort shots and delay blasting cap characterization by GEO and Sandia National Laboratory. Explosives related difficulties are discussed in terms of their general nature, with anecdotal illustration from field experience. Finally, research and product needs are summarized and ranked in terms of importance to a 1990s in situ industry.

29264 **Rock motion modeling of oil shale cratering experiments.** Gorham-Bergeron, E. (Sandia National Labs., Albuquerque, NM). pp 151-159 of Research and engineering applications in rock masses. Volume 1. Ashworth, E. Accord, MA; A.A. Balkema Pub. (1985). (CONF-850671—).

From 26. U.S. symposium on rock mechanics; Rapid City, SD, USA (26 Jun 1985).

This paper describes the structure and functioning of the rock motion code CAROM. CAROM (Calculated Rock Motion) is a stabilized and improved version of the rudimentary motion code BUMP (Schamaun, 1984), developed at Sandia National Laboratories (SNL) for the in situ oil shale recovery program. The paper also provides results of CAROM calculations of material motion during blasting of a single borehole in rock and comparison with motion measurements made for cratering tests conducted in oil shale by Sandia (Parrish, 1984) in 1983.

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 29262, 29263, 29264, 29275

29265 **Combustion heater for oil shale.** Mallon, R. G.; Braun, R. L.; Lewis, A. E.; Walton, O. R. (to The United States of America as represented by the United States Department of Energy). US Patent 4,539,917. 10 Sep 1985. Filed date 21 Sep 1983. vp.

PAT-APPL-534427.

A combustion heater for oil shale heats particles of spent oil shale containing unburned char by burning the char. A delayed fall is produced by flowing the shale particles down through a stack of downwardly sloped overlapping baffles alternately extending from opposite sides of a vertical column. The delayed fall and flow reversal occurring in passing from each baffle to the next increase the residence time and increase the contact of the oil shale particles with combustion supporting gas flowed across the column to heat the shale to about 650°-700° C. for use as a process heat source.

29266 **A method for estimating permeability in oil shale retorts based on pressure and temperature measurements.** Rye, P.B.; White, L.W.; Purcupile, J.C. (The Univ. of Oklahoma, Norman, OK 73019). pp 225-233 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

A general method of estimating parameters in elliptic boundary value problems is applied to the problem of estimating permeability in large modified in situ (MIS) oil shale retorts. Three computer programs were written to test the method: the first to solve the problem in one-space dimension with homogeneous boundary conditions, a second to solve the problem in two-space dimensions with homogeneous boundary conditions, and a third to solve the problem in one-space dimension with non-homogeneous boundary conditions. Preliminary results with "nice" test functions yield good test results for all three programs, but trials with the third program incorporating realistic boundary conditions, pressure, and temperature data indicate that there may be problems in practical application of the method.

29267 **Pressure loss in packed beds of low void fraction.** Purcupile, J.C.; Jensen, C.M.; Jayakaran, P.N. (Univ. of Oklahoma, School of Aerospace, Mechanical and Nuclear Eng., Norman, Oklahoma 73019). pp 234-239 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

A model to predict pressure loss in in-situ oil shale retorts of low void fraction has been formulated. The model, based on physical properties of the packed bed, is compared to the empirical Ergun equation. The pressure loss per unit length is expressed in terms of the superficial velocity, void fraction, aspect ratio, and particle size. The retort is also assumed to be uniform and void fraction isotropic. Experiments were performed to compare the model with pressure loss measurements in a two dimensional packed bed of low void fraction. Test parameters included void fractions in the range of 15% to 24%, superficial velocities to 200 ft/hr and aspect ratio's of 1.16 to 23.8. The maximum error in calculated total pressure drop compared to the experimental value in the packed bed ranged from 11% for a void fraction of 15.2% to 4.7% for a void fraction of 24.5%. The average error was less than 6%.

29268 **Results of mathematical modeling of oil shale retorting in an aboveground, external-combustion, moving-bed retort.** Braun, R.L.; Lewis, A.E. (Lawrence Livermore National Lab., Livermore, CA 94550). pp 133-143 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—). Contract W-7405-ENG-48.

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Our one-dimensional mathematical model for simulating the chemical reactions and physical processes involved in oil shale retorting was applied to the indirect mode of operating an above ground retort in which externally heated recycle gas provides the heat required for the retorting process. Countercurrent to the hot gas flow, a moving bed of shale is pushed upward through an expanding conical reactor, as in the Union B retort. The model was applied to a hypothetical set of commercial-scale conditions in order to identify key operating or design parameters. Variations in recycle-gas temperature and flow rate, shale flow rate, shale grade, water content, particle size distribution, bed porosity, uniformity of bed porosity, and retort dimensions were studied. The results of these calculations help identify the relative importance of the different process parameters in terms of oil yield, pressure drop, exit temperature of gas and shale, fuel consumed in heating the recycle gas, compressor power, condenser cooling load, and reactor size.

29269 **Initial results of Green River Oil Shale Processing using the University of Utah's pilot scale bottom burning retort.** Jacobs, H.R.; Oliva, J.M. (The Pennsylvania State Univ., Dept. of Mechanical Eng., University Park, PA). pp 144-154 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

In order to evaluate the "University of Utah Bottom Burning Combustion Oil Shale Retorting Process," a 1.5 tonne pilot scale retort was constructed. Two experiments were conducted in order to provide preliminary data on the process at a pilot scale and to evaluate the adequacy of the design. An ASTM D-1160 distillation of the product oil showed that it contained nearly 30% naphtha and was surprisingly similar to an Arabian light crude. In addition, nearly 91.8% of Fischer assay was produced, which is higher than for other combustion processes reported in the literature.

29270 **A new oil shale retort fluid beds exchanging solids but not gases.** Chong, Y.; Nicklin, D.J.; App, B.Sc.; Tait, P.J. (Dept. of Chemical Eng., Univ. of Queensland, St. Lucia. Qld.). pp 155-161 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

A new reactor system in which two adjacent fluidized beds exchange solids but not gases, has been developed, and patented. The system has been developed as an oil shale retort in which the combustor exchanges solids with the retort - but in which the combustion gases and product gases are kept separate. The partition between the fluidized beds is designed to permit the movement of solids in both directions, but to provide an effective seal against gas mixing. There are no moving parts. High circulation rates can be achieved, and can easily be controlled. Gas mixing at less than the 2% level can be achieved without a neutral blanketing gas to seal the interface. It should be possible to achieve zero leakage with a blanketing gas. Research has been carried out on various two-dimensional and three-dimensional cold models; and a small bench scale operating retort has been tested. The reactor system has many potential applications including gasification and pyrolysis of coal; hydrogen production; heat exchange in difficult conditions; SO_2 removal by absorption or adsorption.

29271 **Pyrolysis of oil shale in supercritical toluene reaction mechanism and role of hydrogen.** Baldwin, R.M.; Lane, G.S.; Chen, K.W. (Chemical Eng. Dept., Colorado School of Mines, Golden, CO 80401). pp 176-181 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Oil shale from the Stuart A deposit in Queensland, Australia has been extracted with supercritical toluene in the presence and absence of gas-phase molecular hydrogen. Data have been collected in a 300-cc stirred tank autoclave, at a nominal residence time of 1 hour, temperatures of 698 and 733 K, and 14.43 MPa total pressure (at temperature). Results for conversion of organic carbon to oil have been computed based on a carbon balance on the reaction system. The data have shown toluene to be an excellent dense-gas media for extraction of oil from oil shale. Carbon conversions and oil yields of 86% and 95% respectively were achieved in the presence of gas-phase molecular hydrogen. Carbon conversions were severely depressed in the absence of hydrogen, clearly indicating the need for hydrogen activity in order to obtain high oil yields. An overall oil yield of 160% of Fischer Assay was achieved at a relatively low hydrogen consumption and moderate operating conditions.

29272 **Update on the American Syn-Crude/Indiana Shale Oil Project.** Eitel, G.L.; Domahidy, G. (Stone & Webster Eng. Corp., Denver Operations Center, Denver, CO 80217). pp 216-224 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The commercialization of Eastern Devonian oil shales using the mature Petrosix retorting process from Brazil has been developed during the past six years. Today, a 2150 BBLS/SD shale oil plant is being designed for an Indiana site using a single Petrosix retort train concept to minimize initial investment, to demonstrate the proven technology that was developed from a similar oil shale in Brazil, and to provide a rapidly expandable industrial opportunity when economics are favorable in the United States. Initially, this project was planned for a Kentucky site. However, project funding was not available until the site was shifted to Indiana and the project scope was reduced to a minimum level that the sponsors would feel justified in again requesting price and loan support from the US Synthetic Fuels Corporation. This paper presents an update and overview of this Indiana Shale Oil Project which is planned to be operational by 1990.

29273 **Marketable transport fuels from Julia Creek shale oil.** Stephenson, L.; Muradian, A.; Fooks, C.J.R.; Atkins, A.R.; Batts, B.D. (CSR Ltd., 1 O'Connell Street, Sydney, NSW 2000). pp 196-209 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The naphtha fraction of Julia Creek shale oil (IBP-196°C, 6.2%S, 0.38%N) has a relatively high aromaticity, but almost one quarter of it consists of thiophene derivatives, with 2- and 2,5-substitution predominating. Their hydrodesulfurization would require large amounts of hydrogen and lead to low octane rating products. A commercial Co-Mo hydrotreating catalyst readily converted the naphtha to material suitable for isomerization and reforming (0.2 ppm S, 0.5 ppm N) in a single step process. The product's high aromatic and naphthenic contents indicate that it can be easily upgraded to specification unleaded gasoline. The topped crude (196°C-FBP, 5.5%S, 1.86%N) was hydrotreated separately in two stages. Following initial hydrostabilization the 196-317°C cut was distilled and further treated over a commercial Ni-Mo catalyst. The jet fuel fraction of the product is the first shale derived synfuel produced in Australia to pass all ATF-1A tests, although it is significantly more naphthenic than petroleum derived aviation fuel. The diesel fraction's cetane index (45.9) indicates excellent potential for automotive use. Although its boiling point distribution needs modification, all other ADO specifications have been met. This recent study has shown that production of specification transport fuels from Julia Creek shale oil is technically feasible using conventional refining technology.

29274 **Pyrolysis of model alkyl pyridine compounds.** Mushrush, G.W.; Stalick, W.M.; Cooney, J.V.; Hazlett, R.N. (George Mason Univ., Fairfax, VA 22030). pp 123-132 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Polar heterocyclic compounds present in middle distillate fuels have been implicated in the chemical processes involved in fuel instability. Nitrogen containing aromatics are often intimately

involved in reactions leading to deposition of insoluble sediments. Heteroaromatic compounds containing unbranched long chain alkyl groups which rupture during thermal refining are considered likely sources for both the short chain polar heterocyclic and a large quantity of the n-alkane compounds found in finished fuels. Crude shale oil contains approximately 2% nitrogen, by weight. Assuming an average molecular weight of 280, nitrogen-containing compounds constitute 40% of the total crude. Based on GC/MS analyses of nitrogen compounds found in crude shale oil, alkyl pyridines were selected as model compounds for pyrolysis. The compounds pyrolyzed were 2-pentadecylpyridine, 3-pentadecylpyridine, 4-pentadecylpyridine and the disubstituted pyridine, 2,5-dinonylpyridine. They were pyrolyzed in both stainless steel and quartz tubes at temperature and pressure conditions similar to the petroleum refining process known as delayed coking. Free radical attack at the alpha and gamma positions in the side chain was found to be favored. The major initial product distribution can be explained on the basis of Fabuss-Smith-Satterfield theory.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 29257, 29274, 29278, 29287

29275 (STEV-BF—86-2) Laboratory studies of the kinetics at high temperature pyrolysis of shale. Final report. Holst, L.; Bjerle, I.; Andersson, L.A. (Statens Energiverk, Stockholm (Sweden)). Nov 1985. 34p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751688.

During 1985, experiments have been made concerning high temperature pyrolysis of shale from the Kvarntorp deposit, in a free-fall reactor at the Dept. of Chemical Engineering II, Lund Inst. of Technology. The main purpose was to investigate how the shale conversion and product gas composition are influenced by temperature and particle size. From the experiments it will be seen that the conversion increases with increased temperature and with decreased particle size. The composition of the gas changes towards synthetic gas with increasing temperature, with a CO:H_2 ratio of 1:2 at 1400 degrees C. There is almost no influence by particle size. Dependence of activation energy on the particle size was also determined.

29276 Fluorine in Colorado oil shale. Dyni, J.R. (US Geological Survey, Box 25046, Denver Federal Center, CO). pp 9-20 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Oil shale from the lower part of the Eocene Green River Formation in the Piceance Creek Basin, Colorado, averages 0.13 weight percent fluorine, which is about twice that found in common shales, but is the same as the average amount found in some oil shales from other parts of the world. Some fluorine may reside in fluorapatite; however, limited data suggest that cryolite may be quantitatively more important. Analysis of 913 samples from two core holes that penetrate the lower 375 m of the oil-shale deposits found fluorine to range from 0.001 to 2.2 weight percent; about 90 percent of the samples contain between 0.001 and 0.20 weight percent fluorine. The analyzed sequence consists of mostly nahcolite-bearing dolomitic oil shale, except for the lower 55-75 m, which consists of illitic oil shale. The fluorine content of much of the nahcolitic oil shale is somewhat lower, and much more variable from sample to sample, than that of the underlying illitic oil shale. Vertical profiles of the fluorine content for the two core holes through the same stratigraphic interval are essentially dissimilar. The abundance of fluorine seems unrelated to shale-oil content, except in the R-5 zone and near the base of nahcolite-bearing oil shale where there is a moderate positive association. Fluorine and phosphorus abundances show mostly little or no association, and only moderate positive association in some scattered samples.

0406 Direct Uses And By-products

29277 Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation. White, J.C.; Mauser, J.E.; Henry, J.L. (U.S. Bureau of Mines, P.O. Box 70, Albany, OR 97321). pp 182-195 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The objective of this Bureau of Mines bench scale research was to investigate the possibility of producing reduction-grade alumina from dawsonitic oil shale. Leaching of minus 2-mm retorted shale in basic sodium aluminate solutions produced supersaturated sodium aluminate solutions (pregnant liquor) from which alpha alumina trihydrate (gibbsite) may be precipitated by conventional Bayer precipitation techniques. Impurity levels in pregnant liquors of calculated steady-state compositions were synthesized and carried through purification, Bayer precipitation, and carbonation. The Bayer-precipitated alumina approaches reduction-grade purity specifications for most elements, with the exception of Mg and B and possibly F. A bleedstream, necessary for removal of excess soda, serves to limit the buildup of impurities in plant liquors. Excess soda would be recovered as soda ash. An economic evaluation indicates that alumina could be produced from retorted oil shale at a price competitive with that of alumina produced from a newly constructed Bayer alumina plant.

0407 Health And Safety

29278 Fire hazards of oil shale dust layers on hot surfaces. Miron, Y.; Lazzara, Ch.P. (US Dept. of the Interior, Bureau of Mines, Pittsburgh Res. Center, Cochrans Mill Road, P.O. Box 18070, Pittsburgh, PA 15236). pp 83-100 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The Bureau of Mines, under a cooperative agreement with the Colorado Mining Association, evaluated the fire hazards of oil shale dust layers on hot surfaces. The minimum hot surface ignition temperatures of three fine and one coarse oil shale dusts (20 to 50 gal/ton) and of two Pittsburgh bituminous coal dusts, fine and coarse, were determined on a hotplate. Dust layers were 10 cm in diameter and 6.4 to 25.4 mm thick. Test equipment and procedures recommended by the National Academy of Sciences for determining the minimum hot surface ignition temperatures of dusts were used in the tests. The minimum hot surface ignition temperatures for the fine dusts ranged from 200°C to 325°C and depended on oil shale grade and layer thickness. The values for 50-gal/ton oil shale dust and Pittsburgh coal dust were similar for layer thicknesses of 12.7 mm and 25.4 mm. Coarse dust layers had significantly higher minimum ignition temperatures. Glowing particles were observed only in the tests with 50-gal/ton oil shale dust, most often with the 6.4-mm layers. Flaming combustion did not occur in any of the tests even at hot surface temperatures near 400°C. Tests with 50-gal/ton oil shale and Pittsburgh coal dust layers were also conducted in an enclosure containing a flammable methane-air mixture at hot surface temperatures between 350°C and 400°C. The layers underwent glowing combustion, but did not ignite the flammable mixture.

0408 Marketing And Economics

REFER ALSO TO CITATION(S) 29940

0409 Waste Research And Management

29279 Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics. Taback, H.; Goldstick, R. (KVB, Inc., Irvine, CA 92714). pp 248-257 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The EPA's mobile wet scrubber was used on a 200 ACFM slipstream of the Geokinetics retort offgas to investigate the H_2S removal efficiency and selectivity (percent H_2S removal/percent CO_2 removal) as a function of liquid/gas contact time, alkaline solution OH^- concentration, and the specific scrubbing chemical. A venturi and a tray tower were used to produce contact times of approximately 0.003 and 0.2 second, respectively. Three alkaline solutions, NaOH, KOH, and NH_4OH were employed on each contactor at various concentrations for a total of 22 runs. To analyze these results and provide design criteria for future alkaline scrubbers a sophisticated computer model employing the penetration theory for liquid-phase mass transfer was developed.

29280 **Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics.** Taback, H.; Quartncy, G.; Bates, E. (KVB, Inc., Irvine, CA). pp 258-266 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The EPA transportable Stretford process pilot plant was used on a 700 ACFM slipstream of in situ shale oil retort offgas to investigate H_2S removal efficiency and process compatibility. This was the fourth application of the pilot plant which had demonstrated a continuously improving performance. During this test the pilot plant was operated first with a venturi contactor alone and then with the venturi followed in series by a packed tower contactor. With the venturi alone, the plant achieved 95 percent removal efficiency, but its average performance was lower. With the addition of the packed tower, the removal efficiency reached 99+ percent. Excessive foaming of the process solution was experienced which was attributed to the presence of organic aerosol in the retort offgas.

29281 **Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort.** Place, B.G.; Hobbs, R.; Turner, T.F.; Katz, D. (Div. of Environmental Eng., Western Res. Inst., Laramie, WY 82071). pp 267-277 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Western Research Institute (WRI) has investigated Venturi scrubber performance in removing shale oil aerosols from off-gas generated by WRI's 10-ton oil shale retort. The investigation's objectives were: 1. derivation of aerosol removal correlations applicable to commercial oil shale plant design; 2. investigation of residence time distribution techniques in correlating Venturi scrubber operating parameters; 3. investigation of optical particle measurement techniques such as transmissometry in the determination of shale oil aerosol loading. The aerosol penetration correlation introduced by Calvert et al., found in the "Scrubber Handbook," was shown to be suitable in describing aerosol penetration through a Venturi scrubber, and its use is recommended in the design of oil shale off-gas treatment processes. Results of the residence time distribution studies suggest that the Venturi scrubber-cyclone system is a pseudo backmix system. The experiments in transmissometry demonstrated the transmissometer to be a useful analytical tool to monitor aerosol loading in retort off-gas. The experimental results are the basis for recommending that transmissometers be installed on both the inlet and outlet of the Venturi scrubber to allow on-line measurement of the aerosol penetration. Future research is suggested which involves an analysis of the aerosol removal problem in which the surface of the aerosol and the surface of the water droplet are assumed to be mobile.

29282 **Nitric oxide (NO) emissions from combustion of retorted oil shale.** Taylor, R.W.; Harris, C.J.; Barnham, A.K. (Lawrence Livermore National Lab., Livermore, CA). pp 278-289 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Emissions of nitric oxide (NO) from combustion of retorted Colorado oil shale are of concern, because they are approximately equal to limits allowed for coal combustion when compared on an equivalent energy basis. The fraction of nitrogen (N) in retorted shale released as NO increases with combustion temperature and is as high as 20% at 550-700°C. All NO comes from shale, not from N_2 in air, at these temperatures. Another factor increasing NO emissions is the N content of the fuel, which in turn is affected by the presence of oxidized shale (used as a heat carrier in some processes) during retorting of raw shale. During recycle-type retorting processes, when raw shale is retorted by being mixed with hot, oxidized shale, coke is deposited on the oxidized shale. This coke becomes a fuel in subsequent combustion, and the NO/CO_2 ratio from the combustion of the coke is approximately the same as from the combustion of retorted shale. Finally, release of most of the NO during combustion follows the release of most of the CO_2 and H_2O. Thus, emissions of nitrogen oxides (NO/sub x/) from retorted-shale combustors may be substantially reduced by limiting the extent of char combustion.

29283 **Estimating solid wastes from oil shale facilities.** Heistand, R.N. pp 291-297 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The uncertainties associated with the planned oil shale facilities make it difficult to estimate the types and amounts of solid wastes that may be produced. Such estimates are often needed for permit applications and environmental assessments long before the final design of the facility is complete. A means of obtaining estimates of the types and quantities of solid wastes is presented in this paper. Published information, EIS's and Pollution Control Technical Manuals from various planned oil shale facilities, is used to determine correlation factors. These factors are used to correlate the types and quantities of specific solid wastes with tons of shale mined. Mean factors and standard deviations have been determined for the following: major solid wastes (spent shale, raw shale fines and dusts, non-marketable by-products, and scrap and garbage); spent catalysts; used chemicals; sludges and slurries.

29284 **Liquid and vapor transport coefficients for retorted oil shale.** McWhorter, D.B.; Brown, D. (Dept. of Agricultrual and Chemical Eng., Colorado State Univ., Eng. Res. Center, Fort Collins, CO 80523). pp 298-316 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Water movement in surface-disposed retorted oil shale will result from the redistribution of placement waters and any net infiltration to the pile. It is expected that water contents in the pile will remain small and transport will occur by both liquid and vapor processes. Measurements of the liquid and vapor transport coefficients for a Lurgi retorted oil shale were made over the full range of water contents. These measurements were made by a new method in which a sodium iodide solution is injected at low rates into dry retorted shale. The movement of iodide and water are measured simultaneously by attenuation of two different energy gamma rays. These data permit the calculation of both vapor and liquid transport coefficients as functions of liquid water content. Liquid conductivity was measured down to 10^{-13} cm/s while vapor diffusivity was measured down to 10^{-6} cm^2/s. It was discovered that there is a critical water content, below which the liquid conductivity is apparently zero. Implications of these and other experimental observations relative to moisture movement and leachate control in disposed retorted oil shale are discussed.

29285 **The effect of residual carbon on adsorption of organic compounds by retorted oil shale.** McGowan, L.J.; Sorini, S.S. (Div. of Environmental Chemistry, Western Res. Inst., Laramie, WY 82071). pp 317-325 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The proposed practice of codisposing spent shale and oil shale retorting waters has caused concern about the environmental impact of the organic constituents in the process waters. The application of oil shale retorting process waters to hot spent shale may cause the mobility of organics species while irreversibly retaining other organic compounds. The mobility and retention of the resulting organic chemical substances will be affected by the chemical and physical properties of the spent shale and the organic substance. Particularly, the residual carbon content of the spent shale would be expected to possess sorptive properties similar to activated carbon and absorb organic substances. This paper reports research focused on determining the relationship between spent shale residual carbon content and the sorption of organic compounds that have previously been identified in shale process waters.

29286 **Assessing potential trace metal leachability of retorted oil shale by complexometric agents.** Esmaili, E.; Carroll, R.B.; Jackson, L.P. (Div. of Environmental Chemistry, Western Res. Inst., Laramie, WY 82071). pp 326-337 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

Leaching with complexometric agents may offer a quick and effective method for assessing the potential long-term leachability of retorted oil shale. Complexometric agent leaching may establish the upper limit at which elements of environmental concern can be released to the environment and the capability of waste shales to release them. In this study, a sample of indirectly retorted oil shale was leached with deionized-distilled water and strong complexometric agents. These complexometric agent solutions were 0.5 M sodium citrate (citrate), 0.05 M diethylenetriamine pentaacetic acid (DTPA), and 0.05 M ethylenediamine-tetraacetic acid (EDTA).

29287 **An evaluation of the effects of weathering on a 50-year old retorted oil-shale waste pile, Rulison Experimental Retort, Colorado.** Tuttle, M.L.; Dean, W.E.; Ackerman, D.J. (US Geological Survey, M.S. 916, P.O. Box 25046, Denver Federal Center, Denver, CO 80225). pp 338-346 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

An oil-shale mine and experimental retort were operated near Rulison, Colorado by the US Bureau of Mines from 1926 to 1929. Samples from seven drill cores from a retorted oil-shale waste pile were analyzed to determine 1) the chemical and mineral composition of the retorted oil shale and 2) variations in the composition that could be attributed to weathering. Unweathered, freshly-mined samples of oil shale from the Mahogany zone of the Green River Formation and slope wash collected away from the waste pile were also analyzed for comparison. The waste pile is composed of oil shale retorted under either low-temperature (400-500°C) or high-temperature (750°C) conditions. The spent shale produced by the high-temperature retort is identified by the minerals akermanite and diopside, products formed from the reaction of silicate minerals with calcium and magnesium carbonates. The results of the analyses show that the spent shale within the waste pile contains higher concentrations of most elements relative to unretorted oil shale. The mineral and chemical characteristics of the waste pile have remained essentially unchanged for the 50 years that the pile has been exposed to weathering. Little redistribution of elements has occurred within the waste pile and there has been no detectable migration of elements from the waste pile into underlying slope wash. These results have implications for the long-term chemical stability of spent-shale waste piles.

0410 Environmental Aspects

REFER ALSO TO CITATION(S) 29256, 30624

05 NUCLEAR FUELS

0502 Exploration

REFER ALSO TO CITATION(S) 30180

29288 **(USGS/MAP/I—159-B) Structure and uranium deposits of the Salina Quadrangle, Utah.** Williams, P.E.; Hackman, R.J. (Geological Survey, Reston, VA (USA)). 1983. 16p. USGS Open File Services, Box 25425, Federal Center, Denver, CO 80225. File Number TI86900447.

Structure contours were drawn on the base of the Dakota Sandstone, or on the base of the Tununk Member of the Mancos Shale where the Dakota is absent. The map shows uranium ore deposits and prospects. (ACR)

0505 Enrichment

REFER ALSO TO CITATION(S) 29452

29289 **(CEA-CONF—8131) Uranium enrichment by solvent extraction.** Lerat, J.M.; Lorrain, C. (CEA Etablissement de la Vallee du Rhone, 30 - Bagnols-sur-Ceze (France)). Sep 1985. 10p. (CONF-850947—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751369.

From International meeting on solvent extraction and ion exchange in the nuclear fuel cycle; Harwell, UK (3 Sep 1985).

The present reports presents the current development program of the French chemical process CHEMEX and describes its latest achievements. The process is based on an isotopic effect between UIII and UIV. The elementary effect reaches separation factor of 1.025. Enriched and depleted fractions are separated by solvent extraction. Enrichment requires the cascading of several thousands of separation stages. Industrial and commercial features of the CHEMEX Plants and economics of the process are indicated. Present achievements and future perspectives of the CHEMEX Project are reviewed. In spite of the depressed state of enrichment need advantages of the process are an excellent economy at small scale, use of conventional techniques and operation flexibility.

29290 **(CEA-R—5314) Production of a Raman laser at 16 μm.** Clerc, M.; Isnard, P.; Salvetat, G.; Weulersse, J.M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Oct 1985. 73p. (In French). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751345.

The frequencies conversion of the emission of a TEA CO_2 laser by stimulated Raman scattering in hydrogen provides an intense radiation field in the 13 to 17 μm range for laser isotope separation of uranium by the molecular process. The stimulated Raman scattering theory is recalled. The mains parameters involved in this frequency conversion are analysed. They allow to define the spatial and spectral feature of the CO_2 laser necessary for the experiment, as well as the parameters of the amplifying cell. The amplifier is a multiple pass cell which allow 80 to 160 m of interaction length in the para-hydrogen at 77 K. Performance of the apparatus and the first experimental results are presented. An output of 240 mJ in 40 ns is obtained at 16 μm for an imput pump energy of 3.4 J.

0506 By-products

REFER ALSO TO CITATION(S) 30314

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 30082, 31143

29291 **(FRNC-TH—2223) Study of reducing pyrohydrolysis of uranyl fluoride into uranium dioxide.** (Lyon-1 Univ., 69 - Villeurbanne (France)). Jun 1977. 208p. (In French). NTIS (US Sales Only), PC A10/MF A01. File Number DE86751368.

The dry process studied in this paper for the preparation of UO_2 (for sintering) from UF_6 presents the following advantages on other wet or dry processes (fluidized beds or discontinuous processes): it is completely continuous, one chemical reactor only is required for the successive reactions hydrolysis, pyrolysis and reduction, it is possible to obtain various densities after sintering and particularly high densities. Safety, environmental, economical and technical aspects are also improved. Pyrohydrolysis and reduction reactions of UO_2F_2 into UO_2 are studied because kinetics are not well known although they have been used for several years. Reaction temperature and pressure are examined for optimization. Influence of the gaseous mixture hydrogen and inert gas on reaction inhibition could lead to rate, in particular nitrogen flow should be reduced. Operation and product quality should be both improved. 68 refs.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 29402, 30313

29292 **(CONF-860603—1) Head-end and solvent extraction studies using fast-flux test facility fuel.** Benker, D.E.; Bigelow, J.E.; Bond, W.D.; Campbell, D.O.; Chattin, F.R.; Crouse, D.J.; Fellows, R.L.; King, L.J.; Kitts, F.G.; Mailen, J.C. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86006213.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

High-burnup mixed oxide fuel pins from the Fast-Flux Test Facility (FFTF) reactor were sheared in a single-pin shear, dissolved in nitric acid, and then used in solvent extraction tests to assist in establishing operating parameters for fuel recycle facilities. The fuel burnups were 2, 36, 55, and 90 MWd/kg for initial cooling times of 2.5, 1.3, 1, and 1 year, respectively. These tests include the first experiments using fuel of approximately the reference burnup (80-MWd/kg peak burnup) irradiated under reference conditions. The FFTF is a sodium-cooled reactor with stainless steel-clad fuel; the oxide fuel, which is of two compositions, has Pu/(U + Pu) ratios of ~0.225 and 0.275. The peak fuel center temperature was about 1640°C, the peak internal cladding temperature was ~530°C, the peak heat rating was ~300 W/cm, and the peak fluence (E > 0.1 MeV) was ~15.7×10^{22} neutrons/cm^2.

29293 **(CONF-860603—2) Acid-split flowsheets for uranium-plutonium partitioning without a reductant.** Campbell, D.O.; Crouse, D.J.; Mills, A.L. (Oak Ridge National Lab., TN (USA); UKAEA Atomic Energy Research Establishment, Harwell). 1986. Contract AC05-84OR21400. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86006071.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

The flowsheet discussed has been tested in a hot cell experiment using 10% TBP and a poorly controlled temperature near 15°C. The test was carried out in the Solvent Extraction Test Facility at Oak Ridge National Laboratory, using highly irradiated mixed-oxide fuel from the Fast Flux Test Facility reactor at Hanford, Washington. The observed concentration profiles for U, Pu, and acid are shown graphically.

29294 **(LA-UR—86-273) Regeneration and recycle of spent oxide reduction solvent salts used in pyrochemical plutonium recovery operations at Los Alamos.** Fife, K.W.; Bowersox, D.F.; Simpson, J.J.; Davis, C.C.; Phillips, B.J.; McCormick, E.D. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 7p. (CONF-860603—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE86007387.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

One method used at Los Alamos for producing plutonium metal is to chemically reduce the oxide with calcium metal in molten $CaCl_2$ at 850°C. The solvent $CaCl_2$ from this reduction step is currently discarded as low-level radioactive waste because it is saturated with the reaction by-product, CaO. We have developed and demonstrated a molten salt technique for rechlorinating the CaO, thereby regenerating the $CaCl_2$ and incorporating solvent recycle into the batch PuO_2 reduction process. We discuss results from salt regeneration and recycle experiments, and present our plans for incorporating the technique into an advanced design for semi-continuous plutonium metal production.

29295 **(ORNL/TM—9913) Pulsatile fluidic pump demonstration and predictive model application.** Morgan, J.G.; Holland, W.D. (Oak Ridge National Lab., TN (USA)). Apr 1986. Contract AC05-84OR21400. 36p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010078.

Pulsatile fluidic pumps were developed as a remotely controlled method of transferring or mixing feed solutions. A test in the Integrated Equipment Test facility demonstrated the performance of a critically safe geometry pump suitable for use in a 0.1-ton/d heavy metal (HM) fuel reprocessing plant. A predictive model was developed to calculate output flows under a wide range of external system conditions. Predictive and experimental flow rates are compared for both submerged and unsubmerged fluidic pump cases.

29296 **(ORNL/TM—9926) Consolidated Fuel Reprocessing Program. Progress report, October 1-December 31, 1985.** (Oak Ridge National Lab., TN (USA)). Apr 1986. Contract AC05-84OR21400. 34p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86010068.

At Georgia Tech Research, an eight-stage centrifugal contactor has been reconditioned and installed in a laboratory facility for tests with an interstage electroreduction cell. The latest version of the SEPHIS computer code for solvent extraction process modeling has been made operational on the IBM PC. Cropping of simulated fast reactor fuel assemblies by laser cutting has been successfully demonstrated. Interchange of structural components by remote means has been successfully demonstrated on the shear system. The interchange is necessary to reconfigure the shear to handle different types of fuel assemblies. The transporter used to support and position the servomanipulators has been received and installed. Prototypical racks for process equipment were completed and installed. These racks will be used to develop and refine techniques for performing remote maintenance. The acid concentration portion of the Iodox system was operated continuously for two separate 5-d periods. The system was checked out, and hyperazeotropic acid was produced during this operation. The dissolver off-gas (DOG) system was modified, and initial iodine transport tests were completed. Preliminary examination of the experimental data indicates that the double overhead condensers in the modified dissolver off-gas line design allowed iodine to pass through and condensed water vapor to recycle back to the dissolver. The automatic sampling of the digester tanks using the Remote Operation and Maintenance Demonstration (ROMD) automated liquid sampler was demonstrated. An agreement was signed between the DOE and the Commissariat a l'Energie Atomique (CEA) of France to exchange information in the field of Remote Systems Technology.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 29443, 30333, 30334, 30338, 30347, 30348, 30349, 30350

29297 (CONF-850314—Vol.2, pp 297-298) **TMI-2 spent fuel shipping.** Quinn, G.J.; Burton, H.M. (EG and G Idaho, Inc., Idaho Falls). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

TMI-2 failed fuel will be shipped to the Idaho National Engineering Laboratory for use in the DOE Core Examination Program. The fuel debris will be loaded into three types of canisters during defueling and dry loaded into a spent fuel shipping cask. The cask design accommodates seven canisters per cask and has two separate containment vessels with "leaktight" seals. Shipments are expected to begin in early 1986.

29298 (CONF-860604—2) **Improvements in release probability by using an overpack.** Rhyne, W.R.; Ashwood, T.L.; Shappert, L.B. (H and R Technical Associates, Inc., Oak Ridge, TN (USA); Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86003077.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

An analysis was performed to determine the probability of an unconfined release of hazardous material as a consequence of being involved in a severe transportation accident. Two packaging scenarios were considered: (1) material was palletized and placed in a standard aluminum sided trailer, and (2) the same material was placed in an overpackage. In addition to truck, both rail and air transport were also considered. Several release categories were defined ranging from minor to very large, and the effectiveness of the overpackage to reduce the probability of unconfined release was evaluated for each type of release category. The results are applicable to the transport of radioactive materials in similar overpackages. The potential accident scenarios for a pallet of obsolete munitions were identified using a fault-free methodology.

29299 (DP-MS—86-37) **Survey and assessment of radioactive waste management facilities in the United States. Section 2.5. Air-cooled vault storage facilities.** (Bechtel National, Inc., San Francisco, CA (USA)). 1986. Contract AC09-76SR00001. 31p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010315.

There are two basic types of air-cooled vaults for the storage of spent nuclear fuel or vitrified HLRW. The two types, differentiated by the method of air cooling used, are the open-vault concept and the closed-vault concept. The following aspects of these air-cooled vault storage facility concepts are discussed: description and operation of facilities; strucutral design considerations and analysis; nuclear design considerations and analyses; vault environmental design considerations; unique design features; and accident analysis.

29300 (NUREG—1168) **Staff evaluation of US Department of Energy proposal for monitored retrievable storage.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Material Safety and Safeguards). Mar 1986. 179p. NTIS, PC A09/MF A01 - GPO. File Number TI86901173.

As directed by the Nuclear Waste Policy Act of 1982, the US Department of Energy has prepared a proposal for the US Congress for a facility that can be used for the monitored retrievable storage of spent fuel from commercial users. This report describes the evaluation performed by the staff of the US Nuclear Regulatory Commission of the design concepts for the monitored retrievable storage facility proposed by the Department of Energy. On February 5, 1986 the NRC submitted its principal comments to the Department of Energy in the letter shown on the following pages. 30 refs., 10 figs., 2 tabs.

29301 (NUS—4724) **Assessment of the use of half-square cans on the management of spent fuel.** Park, Y.M.; Eckert, H.J.; Arcieri, W.C.; Renner, H.; Ramachandran, S. (NUS Corp., Gaithersburg, MD (USA)). Jan 1986. Contract AC01-84RW00034. 363p. NTIS, PC A16/MF A01; 1; GPO Dep. File Number DE86009740.

This report describes a specific innovation in spent nuclear fuel management and disposal which is fully compatible with the existing square-geometry storage systems at reactors and has the advantage of reducing overall disposal system costs via improved utilization of cylindrical-geometry shipping casks and waste disposal packages. The particular innovation that is described is the use of a "half-square" can in conjunction with full-square cans of consolidated spent fuel rods in various appropriate arrays. The purpose of this report is to describe the technical bases and the economic benefits of using this innovation throughout the spent fuel management system and to identify those circumstances in which this innovation can be of greatest benefit.

29302 (PNL—5731) **Temperature history for canistered fuel lag storage areas during the loss of cooling air at the receiving and handling building of the MRS Facility.** Kim, D. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009879.

The Pacific Northwest Laboratory has analyzed the temperature history at a canistered fuel lag storage area during a postulated failure of the cooling system. A two-dimensional analysis was performed using the GE2D computer code, which accounts for thermal radiation, conduction, and convective heat transfer. The results indicate that the system may not reach a steady-state condition because heat transfer through the top and the bottom of the system is not enough to remove the energy generated in the canistered fuel. Although limits for abnormal operation have not been set, the temperatures do not reach limiting conditions for normal operation for 32 hours, which should be enough time to repair the cooling system.

29303 (PNL—5777-Vol.1) **BWR spent fuel storage cask performance test. Volume 1. Cask handling experience and decay heat, heat transfer, and shielding data.** McKinnon, M.A.; Doman, J.W.; Tanner, J.E.; Guenther, R.J.; Creer, J.M.; King, C.E. (Pacific Northwest Labs., Richland, WA (USA)). Feb 1986. Contract AC06-76RL01830. 315p. NTIS, PC A14/MF A01; 1; GPO Dep. File Number DE86010253.

This report documents a heat transfer and shielding performance test conducted on a Ridihalgh, Eggers and Associates REA 2023 boiling water reactor (BWR) spent fuel storage cask. The testing effort consisted of three parts: pretest preparations, performance testing, and post-test activities. Pretest preparations included conducting cask handling dry runs and characterizing BWR spent fuel assemblies from Nebraska Public Power District's Cooper Nuclear Station. The performance test matrix included 14 runs consisting of two loadings, two cask orientations, and three backfill environments. Post-test activities included calorimetry and axial radiation scans of selected fuel assemblies, in-basin sipping of each assembly, crud collection, video and photographic scans, and decontamination of the cask interior and exterior.

29304 (PNL-SA—13395) **Assessment of spent nuclear fuel shipping cask handling capabilities of commercial light water reactors.** Daling, P.M. (Pacific Northwest Labs., Richland, WA (USA)). Aug 1985. Contract AC06-76RL01830. 8p. (CONF-860317—47). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010222.

From Waste management '86; Tucson, AZ, USA (2 Mar 1986).

Realistic truck/rail modal fractions are specifically needed to support the Monitored Retrievable Storage (MRS) and repository facility designs and envirionmental assessment activities. The objective of this study was to evaluate the spent fuel shipping cask handling capabilities at operating and planned commercial LWRs and use this information to estimate realistic truck/rail modal fractions. The cask handling parameter data collected in this study includes cask handling crane capabilities, dimensions of loading pools, struc-

tural limits, availability of rail service, past experience with spent fuel shipments (i.e., which cask was used.), and any other conditions which could impede or preclude use of a particular shipping cask. The results of this evaluation are presented for each reactor. A summary of the results which indicates the number of plants that are capable of handling each transport mode is presented. Note that two types of highway shipments are considered; legal-weight truck (LWT) and overweight truck (OWT). The primary differences between these two types of highway shipments are the size and cargo capacity of the spent fuel shipping casks. The OWT cask is roughly 50% heavier, 50% larger in diameter, and has a 300% larger cargo capacity. As a result of this size differential, some plants are capable of handling LWT casks but not OWT casks.

29305 **(SAND—85-1016) Radioactive Material (RAM) transportation accident/incident analysis.** McClure, J.D.; Tyron-Hopko, A. (Sandia National Labs., Albuquerque, NM (USA); EG and G Idaho, Inc., Idaho Falls (USA)). Mar 1986. Contract AC04-76DP00789. 23p. (TTC—0558). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009669.

This report summarizes the radioactive material (RAM) transportation accident/incident experience in the United States from 1971 to March 1985. RAM transportation activities that involve accidents or incidents comprise approximately 0.7% of all hazardous material transportation incidents. RAM transport accident/incident experience as a subset of all RAM transport that occurs in a typical year is also presented.

29306 **(SAND—86-0053C) Use of remote systems and automation in radioactive waste shipping and receiving.** Berger, J.D.; Gneiting, B.C.; Sanders, T.L. (Hanford Engineering Development Lab., Richland, WA (USA); Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC06-76FF02170;AC04-76DP00789. 2p. (TTC—0600; CONF-860604—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE86005436.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

A cask handling technology development program is being pursued at the Hanford Engineering Development Laboratory in Richland, Washington and at Sandia National Laboratories in Albuquerque, New Mexico. This is part of the United States Department of Energy's program to enhance nuclear waste transportation technology. The goal of the effort is two-fold; first, to develop concepts that will reduce occupational exposures at shipping cask handling facilities within As Low As Reasonably Achievable (ALARA) objectives as directed by US DOE order (1), and second, to identify any design requirements for future cask development activities that comply with 'design for automation' goals.

29307 **(SAND—86-1088C) Use of robotics for radioactive waste shipping and receiving.** Berger, J.D.; Gneiting, B.C.; Sanders, T.L. (Hanford Engineering Development Lab., Richland, WA (USA); Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 15p. (CONF-860604—9). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010095.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

Radioactive waste shipping and receiving facilities presently planned for commercial and defense high-level nuclear waste will handle waste packages at frequencies far in excess of those in common practice today. If current limits for radiation levels at the cask surface and current handling methods are used, high cumulative personnel exposure to ionizing radiation is projected to occur. To reduce these exposure levels, alternate handling methods are being developed and demonstrated. The production nature of cask receiving operations, suggests commercial robotics be incorporated into a remote handling system to reduce predicted worker exposure to acceptable levels while maintaining or increasing throughput. The first phase of cask handling system development culminated in a proof-of-principle test demonstrating the feasibility of performing cask receiving and unloading operations in a remote and partially automated manner.

29308 **U.S. Department of Energy transportation programs: computerized techniques.** Joy, D.S.; Fore, C.S.; Johnson, P.E.; Peterson, B.E. (Oak Ridge National Laboratory, Oak Ridge, TN). pp 567-574 of Waste isolation in the U.S., technical programs and public education. Vol. 2. La Grange Park, IL; American Nuclear Society (1984). (CONF-840307—).

From Waste management '84; Tucson, AZ, USA (11 Mar 1984).

The U.S. Department of Energy is currently sponsoring the development of four specialized computer-based transportation programs at Oak Ridge National Laboratory. The programs function as research tools that provide unique computerized techniques for planning the safe shipment of radioactive and hazardous materials. Major achievements include the development of interactive rail and highway routing models, an emergency response assistance program, a data base focusing on legislative requirements, and a resource file identifying key state and local contacts. A discussion of the programs and data bases is presented, and several examples reflecting each project's applications to the overall DOE transportation program are provided. The interface of these programs offers a dynamic resource of data for use during preshipment planning stages.

0510 Marketing And Economics

REFER ALSO TO CITATION(S) 29323

0520 Waste Management

REFER ALSO TO CITATION(S) 29299, 29300, 29307, 29430, 29431, 29432, 29433, 29434, 29435, 29436, 29440, 29441, 29442, 29444, 29445, 29446, 29810, 29812, 29831, 30079, 30092, 30147, 30148, 30149, 30153, 30154, 30177, 30189, 30579, 30582, 30586, 30604, 30738, 30739, 30740, 30741, 30742, 30744, 30746, 30748, 30749, 30751, 30752, 30753, 30755, 30756, 30757, 30761

29309 **(AECL—7811) Canadian Nuclear Fuel Waste Management Program. 1983 annual report.** Dixon, R.S.; Rosinger, E.L.J. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Apr 1984. 149p. NTIS (US Sales Only), PC A07/MF A01. File Number DE85900464.

Work performed under Canada/US Waste Management Information Exchange Agreement.

This report, the fifth of a series of annual reports, reviews the progress that has been made in the research and development program for the safe management and disposal of Canada's nuclear fuel waste. The report summarizes activities over the past year in the following areas: public interaction, used fuel storage and transportation, immobilization of used fuel and fuel recycle waste, geoscience research related to deep underground disposal, environmental research, and environmental and safety assessment.

29310 **(AECL—7816) Geological survey of the Lac du Bonnet Batholith, Manitoba.** McCrank, G.F.D. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Feb 1985. 83p. NTIS (US Sales Only), PC A05/MF A01. File Number DE85901164.

Work performed under Canada/US Waste Management Information Exchange Agreement.

This report presents the results of a geological survey of the Lac du Bonnet Bathlith in Manitoba. The survey consisted of field mapping of the lithologies and the joint systems throughout the batholith, and the examination of lineaments identified on aerial photographs and Landsat imagery. Petrographic descriptions and a map of the lithologies, an analysis of the fracture systems and a lineament map are presented. The results of various regional geophysical surveys were used as an aid to the interpretation of the batholith's contacts and in the interpretation of lineaments as possible faults. A comparison of the Lac du Bonnet Batholith with the Eye-Dashwa Lakes Pluton near Atikokan, Ontario, is also presented. 46 refs., 23 figs., 2 tabs.

29311 **(AECL—7819) Photochemical method for radioiodine abatement.** Vikis, A.C. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Nov 1984. 35p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900684.

Work performed under Canada/US Waste Management Information Exchange Agreement.

This report reviews the underlying chemistry of the photochemical method for removal of radioiodines from air and evaluates the concept with respect to various applications in the nuclear industry. The method uses ultraviolet light (200 to 300 nm) to convert organic iodides (RI) to elemental iodine (I_2). The I_2 is then reacted with ozone to form solid iodine oxides (I_4O_9 or I_2O_5), which deposit inside a scrubber. It is concluded that the method is applicable to large-scale systems and would have several advantages over conventional methods of radioiodine abatement.

29312 **(AECL—7824) Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry.** Saluja, P.P.S.; LeBlanc, J.C.; Watson, R.L.; Oscarson, D.W. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jun 1984. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE84901836.

Low surface areas of non-porous mineral and oxide powders have been determined by adsorption calorimetry to a precision of +-5%. Five standards with surface areas in the range 0.64 to 24.3 $m^2.g^{-1}$ were examined to check the internal consistency of our method. Our surface area values agree within +-10% with supplied values, obtained by the Brunauer, Emmett and Teller (BET) nitrogen adsorption technique at -196°C. The present technique is less time consuming than commercial systems and requires small sample size (< 1 g per run). Also, the technique works at 25°C, rather than at -196°C, and can be adapted for routine operation. Finally, the technique appears preferable to a relatively tedious gas-solid chromatographic method, which uses large samples (200 to 300 g), and yields values in poor agreement with BET results. 7 refs., 2 figs., 1 tab.

29313 **(AECL—7827) Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault.** Quigley, R.M. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jul 1984. 49p. NTIS (US Sales Only), PC A03/MF A01. File Number DE84901834.

Work performed under Canada/US Waste Management Information Exchange Agreement.

The quantitative mineralogy of seven candidate buffer and backfill materials for a nuclear fuel waste disposal vault is presented. Two of the materials were coarse grained: one a blended very pure silica sand, and the other a crushed plagioclase-rich granite or granodiorite. Five materials were fine-grained soils containing abundant clay minerals. Of these, three were fairly pure, Cretaceous, ash-derived bentonites that contained up to 3% of soluble sulphates; one was a freshwater glacial clay containing 59% interlayered smectite-illite; and one was a crushed Paleozoic shale containing abundant illite and chlorite. The adsorbed cation regimes and the pore-water chemistry of the clays are discussed. 12 refs., 17 figs., 10 tabs.

29314 **(AECL—8374) Canadian nuclear fuel waste management program.** Rummery, T.E.; Rosinger, E.L.J. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Dec 1984. 25p. (CONF-840802—29). NTIS (US Sales Only), PC A02/MF A01. File Number DE85900232.

From ANS International topical meeting on fuel reprocessing and waste management; Jackson Hole, WY, USA (26 Aug 1984).

Work performed under Canada/US Waste Management Information Exchange Agreement.

The Canadian Nuclear Fuel Waste Management Program is in the fourth year of a ten-year generic research and development phase. The objective of this phase of the program is to assess the basic safety and environmental aspects of the concept of isolating immobilized fuel waste by deep underground disposal in plutonic rock. The major scientific and engineering components of the program, namely immobilization studies, geoscience research, and environmental and safety assessment, are described. Program funding, scheduling and associated external review processes are briefly outlined.

29315 **(AECL—8375) Fuel characterization research for the Canadian Nuclear Fuel Waste Management Program.** Johnson, L.H.; Crosthwaite, J.L. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Nov 1984. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE85900683.

Work performed under Canada/US Waste Management Information Exchange Agreement.

An outline is presented of the fuel characterization work being performed in support of the Canadian Nuclear Fuel Waste Management Program. These studies are being done to evaluate used CANDU power reactor fuel as a waste form. The research program comprises experimental studies of used fuel leaching and dissolution, in addition to the evaluation and compilation of literature data on the characteristics of used CANDU power reactor fuel relevant to its performance as a waste form. Progress in experimental studies is briefly summarized and future research plans are described. An outline is presented of the subjects that will be discussed in future reports on used fuel characteristics relevant to fuel performance under disposal conditions.

29316 **(CEA-CONF—8147) Corrosion studies on HLW steel containers.** Plante, G. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1985. 5p. (CONF-8509239—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751338.

From Workshop on carbon steel corrosion allowance containers for disposal of HLW; Zurich, Switzerland (16 Sep 1985).

The disposal of high level waste requires a series of barriers, one component of this system could be a metallic container having an endurance of 500 to 1000 years and permitting the waste to pass through its thermal period without any contact with the environmental medium. Safety demonstration relative to a steel container based on a limitation of the total weight loss and on kinetics of corrosion in deaerated solutions are presented. Elongation tests were run at 90°C in ground waters for hydrogen embrittlement. The concept of a thick-walled steel container is attractive, nevertheless, the lack of precision concerning the actual conditions in the container environment prevents the corrosion engineers from building satisfactory safety demonstration.

29317 **(CONF-850314—Vol.2) Waste Management '85: Waste Isolation in the US - Technical Programs and Public Education. Volume 2. Waste policies and programs, low-level waste.** Post, R.G. (ed.). (Arizona Univ., Tucson (USA). Coll. of Engineering). 1985. 564p. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Papers were presented at the following sessions: state and regional policies and programs for low-level waste; technical and economic considerations in LLW disposal; institutional and technical considerations in toxic and low-level mixed wastes; alternative methodologies in LLW disposal; low-level waste processing and burial factors; TMI and radiation protection; methods for minimization of radwaste at the source; radwaste system modifications; hydrofracture and grout techniques; dry active waste volume reduction operating experience; liquid waste volume reduction operating experience; and secondary wastes and sludge. Individual papers were processed. (LM)

29318 (CONF-850314—Vol.2, pp 3-5) **Penn State continuing education program on low-level radioactive waste disposal and management: lessons learned.** Vincenti, J.R. (Pennsylvania State University, University). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Since November of 1983, The Pennsylvania State University, Institute for Research on Land and Water Resources has provided the citizens of the Commonwealth of Pennsylvania with information on low-level radioactive waste disposal and management through a continuing education program called the PIER (Public Involvement and Education on Radiation) Program. This paper will review the form, function, and development of this continuing education program and some of the lessons learned in providing citizens of the Commonwealth with information in both formal and informal educational settings.

29319 (CONF-850314—Vol.2, pp 7-10) **Local government participation in the siting of a low-level radioactive waste disposal facility: the Texas experience.** Blackburn, T.W. III; Reed, J.B. Jr. (Texas Low-Level Radioactive Waste Disposal Authority, Austin; Texas Advisory Commission on Intergovernmental Relations, Austin). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Texas Low-Level Radioactive Waste Disposal Authority (the Authority) has been screening the State of Texas for technically suitable areas for the development of a low-level radioactive waste disposal facility. A key element to the success of this effort will be the participation and cooperation of local government officials. Past experience has shown that the influence of local officials on community residents can greatly help or hinder local acceptance of projects similar to this. Participation by local officials and residents in the siting process can help achieve objectives which make a facility not only a safe place to dispose of waste, but also a positive contribution to the community. In Texas, a process is unfolding whereby local communities in areas which have been identified as potential sites will become integral participants in the design, operation, and closure phases of a disposal facility. Ongoing negotiations between the Authority and representatives of the community will be the centerpiece of this approach.

29320 (CONF-850314—Vol.2, pp 11-17) **Texas goes it alone: political and legal considerations.** Mathews, L.H. (Texas Low-Level Radioactive Waste Disposal Authority, Austin). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In 1979, because of emerging problems at the three national low-level radioactive waste (LLW) disposal sites and the mounting public outcry in Texas against in-state storage of LLW, the state found itself facing a rapidly developing crisis in the management and disposal of LLW. Initial attempts by the Texas Legislature to address the crisis failed. Passage by the United States Congress of the Low-Level Radioactive Waste Policy Act of 1980 (LLPA) increased the pressure for remedial legislation on behalf of the state. The sentiment in Texas during the 1979-1981 period was that Texas should handle its own LLW outside the mechanism of a compact. State leaders felt that the January 1, 1986 exclusionary date of the LLPA could more likely be met if Texas instituted its own LLW disposal program. The Legislature in 1981 passed two bills: one established a licensing and registration program for radioactive waste processing and storage facilities in the Texas Department of Health (TDH), and the other created the Texas Low-Level Radioactive Waste Disposal Authority (the Authority) to site, construct, and operate a LLW facility for Texas waste only. The cornerstone of the Authority's statute is the provision that excludes out-of-state waste from a Texas disposal facility. Considerable debate has centered on the legality of that provision in light of the language of the LLPA and the possible applicability of the Preemption and Commerce Clauses of the United States Constitution. Concepts of state sovereignty embodied in several United States Supreme Court decisions provide the basis for the Texas statute and the Authority's continuing LLW program. Recent proposed changes to the LLPA have acknowledged the role of single states in the implementation of a national LLW program.

29321 (CONF-850314—Vol.2, pp 19-22) **California's response to the Low-Level Radioactive Waste Policy Act of 1980: policy and progress.** Pasternak, A.D. (California Radioactive Materials Management Forum, Sacramento, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The public and private corporations and institutions in California that use radioactive materials and generate low-level radioactive waste have played a major role in shaping and guiding California's response to the federal Low-Level Radioactive Waste Policy Act of 1980. Working together as the California Radioactive Materials Management Forum (CAL RAD FORUM), these organizations carry out legislative and public education programs with the objective of establishing, in California, a low-level radioactive waste disposal facility and maintaining access to existing disposal facilities in other states until the California facility is licensed and operating.

29322 (CONF-850314—Vol.2, pp 23-24) **Through the regulatory hoop.** Kirner, N.P. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

There are many regulatory hoops through which waste generators, brokers, and disposal site operators must jump to dispose of waste safely. As the proposed exclusionary date of January 1, 1986, approaches, these regulatory hoops have the distinct possibility of multiplying or at least changing shape. The state of Washington, in its role as an Agreement State with the US Nuclear Regulatory Commission, licenses and inspects the commercial operator of the Northwest Compact's low-level radioactive waste disposal site on the Hanford Reservation. Washington has received as much as 53%, or 1.4 million cubic feet per year, of the nation's total volume of waste disposed. To control such a large volume of waste, a regulatory program involving six agencies has developed over the years in Washington.

29323 (CONF-850314—Vol.2, pp 27-33) **New York State interim waste management cost evaluation.** Ma, M.S.; Watts, R.J.; Jorgensen, J.R. (Impell Corp., Melville, NY; Rochester Gas and Electric Corp., NY). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The purpose of this study is to investigate and quantify the comparative costs associated with including or excluding Class A utility wastes at a centralized interim waste management facility in New York State. The objective of the study is to assess the unit costs and total statewide costs associated with two distinct scenarios: (1) the case where non-utility Class A LLRW is received, incinerated and stored at the centralized interim facility, and utility Class A wastes are held without incineration at respective nuclear power plant interim onsite facilities without incineration; and (2) the alternative case where both utility and non-utility Class A wastes are accepted, incinerated and stored at the centralized facility. Unit costs to waste generators are estimated for each of the two cases described. This is followed by an estimation of the statewide cost impact to the public. The cost impact represents the cost differential resulting from the exclusion of utility Class A waste from the centralized NYS interim waste management facility. The principal factors comprising the cost differential include (1) higher unit disposal fees charged to non-utility waste generators, which are passed along in the costs of products and services; and (2) costs to utilities due to construction of additional onsite storage capacity, which in turn are charged to electric rate payers.

29324 (CONF-850314—Vol.2, pp 35-41) **Transition from storage to permanent disposal of low- and intermediate-level wastes at the Chalk River Nuclear Laboratories.** Hardy, D.G.; Dixon, D.F. (Chalk River Nuclear Labs., Ontario). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A program is underway at CRNL to evolve from a policy of storage of low-level and intermediate-level radioactive wastes to one of permanent disposal. The approach being investigated is to sort the wastes into several categories graded according to their hazardous lifetime and to dispose of each category in a repository best suited to isolate and contain that waste until it no longer poses a radiological hazard. The disposal concepts selected for detailed study include an improved sand trench (IST), an intrusion-resistant shallow land burial (SLB) facility and a shallow rock cavity (SRC). The concept(s) adopted will depend on safety and economic criteria. The construction of a prototype SLB facility is being planned to better assess its operation, short-term performance and economics. The paper outlines the rationale, the strategy and the R and D work involved in the disposal program.

29325 (CONF-850314—Vol.2, pp 43-49) **Geologic considerations in UMTRA Project alternate site selection process.** Brinkman, J.E.; Rager, R.E. (Sergent, Hauskins and Beckwith, Inc., Albuquerque, NM). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC04-82AL14086.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A phased approach was used to select potential sites for disposal of contaminated materials from the Uranium Mill Tailings Remedial Action (UMTRA) Project site in Lakeview, Oregon. An 1800-square-kilometer area centered around the uranium mill site was the initial search region. Sixteen hundred square kilometers were eliminated from consideration with application of geologic, geotechnical, hydrologic, and environmental exclusionary criteria. With additional analysis of existing information, seven sections were selected for further consideration. These seven sites were visited by a team of experts. Potential 16-hectare disposal sites within each of the seven areas were chosen and numerically ranked using a set of geotechnical, geologic, hydrologic, engineering, and environmental inclusionary factors. Subsurface investigations were conducted at the two highest ranking sites. The rankings before and the rankings after the drilling programs and data analysis are compared for ten key geotechnical and geohydrologic factors at the two sites. Conclusions are drawn regarding the appropriateness of the site selection criteria and procedures.

29326 (CONF-850314—Vol.2, pp 57-67) **Subsidence and settlement and their effect on shallow land burial.** Abeele, W.V. (Los Alamos National Lab., NM). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Subsidence and settlement are phenomena that are much more destructive than generally thought. In shallow land burials they may lead to cracking of the overburden and eventual exposure and escape of waste material. The primary causes are consolidation and cave-ins. Laboratory studies performed at Los Alamos permit us to predict settlement caused by consolidation or natural compaction of the crushed tuff overburden. Examples of expected settlement and subsidence are calculated based on the known geotechnical characteristics of crushed tuff. The same thing is done for bentonite/tuff mixes because some field experiments were performed using this additive (bentonite) to reduce the hydraulic conductivity of the crushed tuff. Remedial actions, i.e., means to limit the amount of settlement, are discussed. Finally, we briefly comment on our current field experiment, which studies the influence of subsidence on layered systems in general and on biobarriers in particular.

29327 (CONF-850314—Vol.2, pp 69-72) **Development and use of a remote waste handling system for disposal of greater confinement wastes.** Williams, R.E. (Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC08-84NV10327.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

This paper discusses the design and development of a remotely controlled waste handling system (RWHS) for use in radioactive waste disposal operations. A RWHS was developed at the US Department of Energy's (DOE) Nevada Test Site for use in the Greater Confinement Disposal Test (GCDT). The RWHS consists of a remote control console and the following remotely operated features: a crane, a grapple/manipulator module which is suspended by the crane hoist hook, and closed-circuit television cameras. The RWHS was used to safely place high-specific-activity radioactive waste in greater confinement disposal. Between December 15, 1983, and February 23, 1984, five encapsulated sources were "open-air" transferred from shielded shipping casks and placed 30 m down a 3-m-diameter augered shaft using the RWHS. These sources contained approximately 460 kCi of Sr-90, 21 kCi of Cs-137, and 390 Ci of Co-60. Each source was transferred safely and efficiently and operational personnel did not receive any recordable doses.

29328 (CONF-850314—Vol.2, pp 75-79) **Regulatory framework for hazardous mixed wastes.** Bass, S.J. (NUS Corp., Oak Ridge, TN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A recent court decision has raised the possibility that wastes that are both hazardous and radioactive may be regulated by: the Resource Conservation and Recovery Act of 1976, as amended (RCRA); and by the Atomic Energy Act of 1954, as amended (AEA). A chronological review of regulatory developments and positions is used to identify apparent and potential US Department of Energy (DOE) concerns regarding these wastes and their possible regulation by RCRA. Identified concerns deal with radiological hazards, the prevention of the disclosure of restricted information, problems associated with State regulation, and the lack of feasible alternatives to land disposal.

29329 (CONF-850314—Vol.2, pp 81-84) **Institutional and technical issues in the management of low-level mixed wastes.** McBrayer, J.F.; Jacobs, D.G. (Oak Ridge National Lab., TN; H and R Technical Associates, Inc., Oak Ridge, TN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC05-84OR21400.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Atomic Energy Act of 1954 vested in the Atomic Energy Commission the exclusive authority to regulate source, special nuclear, and byproduct materials and to own and operate the facilities for their production. It further authorized the Commission to regulate any activity covered by the Act in order to protect health and to minimize danger to life and property. In addition, Executive Order 12088 of October 13, 1978, required federal agencies to meet pollution control standards equivalent to those required of the regulated community. These legislative mandates had been interpreted to exempt federal Atomic Energy Act facilities from all outside regulation, until the recent, successful, legal challenge to this interpretation. This court challenge raised the prospect of dual regulation of mixed (radioactive and chemically hazardous) wastes and led us to analyze the consequences of such dual regulation. In addition, the Environmental Protection Agency and the Department of Energy have been developing a basis for delineating their relative responsibilities in order to avoid the necessity for a dual program.

29330 (CONF-850314—Vol.2, pp 85-87) **DOE hazardous waste management program.** Eyman, L.D.; Craig, R.B. (Oak Ridge National Lab., TN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC05-84OR21400.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A Memorandum of Understanding between DOE and EPA has recently been signed; in it DOE essentially incorporates all aspects of the Resource Conservation and Recovery Act for handling hazardous and mixed radioactive wastes. It has become clear that new and effective technologies are needed to adhere to these procedures and to other legislation, such as, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and Toxic Substances Control Act (TSCA). The Assistant Secretary for Defense Programs (ASDP) has established a Hazardous Waste Program to address technology development and technology transfer aspects for DOE sites nation-wide. The assignment for coordinat-

ing, integrating and reporting program activities was given to DOE's Oak Ridge Operations Office which established the Hazardous Waste Management Program (HWP) at Oak Ridge National Laboratory. The goal of this national program is to develop technologies and provide solutions to support ongoing generation, storage, treatment and disposal of hazardous chemical and mixed wastes such that operation of defense facilities is continued and public health and safety are protected with minimum impact on the environment. The near-term strategy is to define the current magnitude and character of HCW, to identify areas of needed improvement in the treatment, storage, and disposal of HCW, to determine resources available to respond to technology development issues and ultimately to develop comprehensive plans to resolve them. Principal supporting objectives are to: act as a central resource for DOE in identifying problems and developing solution; integrate and coordinate activities among DOE installations; and develop databases and disseminate information on methodologies for treatment, storage, disposal and environmental restoration at DOE installations. This paper elaborates on the technical issues, problem areas and progress achieved by DOE's HWP.

29331 (CONF-850314—Vol.2, pp 89-94) **Management of active and abandoned hazardous sites under federal statutes.** Cywin, A. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

There are over two dozen statutes that impact on the handling of hazardous wastes. However, the most critical statutes related to hazardous waste sites are essentially the "Resource Conservation and Recovery Act" for active hazardous waste sites management and the "Comprehensive Emergency Response and Compensation Liability Act" which provides for the clean-up of abandoned hazardous waste sites. The "Clean Water Act", "Clean Air Act" and "Safe Drinking Water Act" are also involved in that the emissions or effluents from hazardous waste sites have to conform to the requirements of those Acts. Federal installations, such as Department of Energy installations are required to comply not only with federal environmental Law but also with state Law, since much of the federal environmental program is delegated to the States.

29332 (CONF-850314—Vol.2, pp 95-98) **DOE approach to threshold quantities.** Wickham, L.E.; Kluk, A.F. (EG and G Idaho, Inc., Idaho Falls; Department of Energy, Washington, DC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Department of Energy (DOE) is developing the concept of threshold quantities for use in determining which waste materials must be handled as radioactive waste and which may be disposed of as nonradioactive waste at its sites. Waste above this concentration level would be managed as radioactive or mixed waste (if hazardous chemicals are present); waste below this level would be handled as sanitary waste. Ideally, the threshold must be set high enough to significantly reduce the amount of waste requiring special handling. It must also be low enough so that waste at the threshold quantity poses a very small health risk and multiple exposures to such waste would still constitute a small health risk. It should also be practical to segregate waste above or below the threshold quantity using available instrumentation. Guidance is being prepared to aid DOE sites in establishing threshold quantity values based on pathways analysis using site-specific parameters (waste stream characteristics, maximum exposed individual, population considerations, and site specific parameters such as rainfall, etc.). A guidance dose of between 0.001 to 1.0 mSv/y (0.1 to 100 mrem/y) was recommended with 0.3 mSv/y (30 mrem/y) selected as the guidance dose upon which to base calculations. Several tasks were identified, beginning with the selection of a suitable pathway model for relating dose to the concentration of radioactivity in the waste. Threshold concentrations corresponding to the guidance dose were determined for waste disposal sites at a selected humid and arid site. Finally, cost-benefit considerations at the example sites were addressed. The results of the various tasks are summarized and the relationship of this effort with related developments at other agencies discussed.

29333 (CONF-850314—Vol.2, pp 99-100) **Strategy and need: DOE's hazardous waste program.** Matthews, C.; Pasko, W. (Department of Energy, Oak Ridge, TN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

At the beginning of fiscal year 1984, the Director of DOE's Office of Defense Waste and Byproducts Management initiated a Hazardous Waste Program to review, coordinate, integrate, and report to Headquarters the hazardous and mixed waste problems at the defense-related facilities. The Oak Ridge Operations Office has been given the lead responsibility for this program. This paper will review the early history and need of the DOE program. The organization, developments, status, and future plans of the new program will be presented, along with a discussion of the research and development presently underway.

29334 (CONF-850314—Vol.2, pp 101-106) **Options for treatment, storage, and/or disposal of radioactive mixed waste at the Idaho National Engineering Laboratory.** Nishimoto, D.D.; Falconer, K.L.; Wiggins, D.J. (EG and G Idaho, Inc., Idaho Falls). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A study is being performed at the Department of Energy's Idaho National Engineering Laboratory (INEL) to determine the most feasible options for the management of INEL radioactive mixed waste and to develop a program plan for implementing the selected options. Radioactive mixed waste generated at the INEL by Department of Energy (DOE) facilities must be managed in accordance with DOE Order 5480.2 and the Memorandum of Understanding between the Environmental Protection Agency Administrator and the Secretary of Energy. These requirements specify that facilities which generate, treat, store, and/or dispose of radioactive mixed waste comply with regulations issued under the Resource Conservation and Recovery Act for hazardous waste. Currently, there are no suitable INEL facilities for the treatment, storage, and/or disposal of radioactive mixed waste. This paper will discuss the type and volume of radioactive mixed waste generated at the INEL; selection criteria used to determine the most viable option (i.e., technical, economic, and regulatory constraints); and available options for treatment, storage, and/or disposal.

29335 (CONF-850314—Vol.2, pp 119-122) **Comparison of low-level radioactive waste management alternatives.** Poor, N.D.; Hertel, N.E. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Low-level radioactive waste disposal and storage facilities, existing and modeled, are compared on the basis of land utilization, occupational radiological hazard, and cost.

29336 (CONF-850314—Vol.2, pp 123-126) **Integration of interim storage and the permanent disposal of low-level radioactive waste.** Mallory, C.W.; DiSibio, R. (Westinghouse Hittman Nuclear Inc., Columbia, MD). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A modularized system for the packaging and disposal of low-level radioactive waste has been developed. This system uses hexagonal, reinforced concrete modules to package the waste in a structurally stable form. The modules are closely packed into the disposal unit to virtually eliminate subsidence. The same modules can also be used for on-site storage of waste. This approach for on-site storage of waste is less expensive than using storage buildings. It also reduces handling and eliminates the need to dispose of modules used for storage alone. An overpack is required to allow the concrete modules to meet the regulations for transporting radioactive material.

29337 (CONF-850314—Vol.2, pp 127-131) **Greater-confinement disposal of radioactive wastes.** Trevorrow, L.E.; Gilbert, T.L.; Luner, C.; Merry-Libby, P.A.; Meshkov, N.K.; Yu, C. (Argonne National Lab., IL). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Low-level radioactive wastes include a broad spectrum of wastes that have different radionuclide concentrations, half-lives, and physical and chemical properties. Standard shallow-land burial practice can provide adequate protection of public health and safety for most low-level wastes, but a small volume fraction (~1%) containing most of the activity inventory (~90%) requires specific measures known as "greater-confinement disposal" (GCD). Different site characteristics and different waste characteristics - such as high radionuclide concentrations, long radionuclide half-lives, high radionuclide mobility, and physical or chemical characteristics that present exceptional hazards - lead to different GCD facility design requirements. Facility design alternatives considered for GCD include the augered shaft, deep trench, engineered structure, hydrofracture, improved waste form, and high-integrity container. Selection of an appropriate design must also consider the interplay between basic risk limits for protection of public health and safety, performance characteristics and objectives, costs, waste-acceptance criteria, waste characteristics, and site characteristics. This paper presents an overview of the factors that must be considered in planning the application of methods proposed for providing greater confinement of low-level wastes.

29338 (CONF-850314—Vol.2, pp 133-135) **Considerations for creating a free-standing monolith.** Salsman, J.M. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Texas Low-Level Radioactive Waste Disposal Authority is investigating alternatives to shallow-land burial for low-level radioactive waste. This alternative proposes a standard shallow-land burial trench with a reinforced concrete floor over a sand bottom, backfilling the trench voids with concrete instead of sand and using a concrete cap covered with clay and top soil. The use of concrete backfilled trenches in a geologically stable, semi-arid area can provide an additional degree of safety, but their use in a geologically unfavorable area could actually create problems. Three reasons for using concrete backfill are: better intruder barriers, creation of a concrete monolith, and lower susceptibility to subsidence. A fourth nontechnical reason is that the public seems to be infatuated with concrete, which may prove to be the best reason for a concrete backfilled trench. The additional cost of using concrete is approximately $7.78/ft^3 of waste buried if the concrete is commercially purchased; however, if a batch plant is utilized, the cost is reduced to $1.43/ft^3.

29339 (CONF-850314—Vol.2, pp 137-140) **Comparison of land and ocean disposal alternatives for bulk wastes containing naturally occurring radionuclides.** Stull, E.A.; Merry-Libby, P. (Argonne National Lab., IL). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Land and ocean disposal alternatives for a large volume of wastes and residues containing naturally occurring radionuclides are assessed. These wastes and residues are currently stored at the US Department of Energy's Niagara Falls Storage Site near Lewiston, New York. Both land and ocean disposal are considered for the 180,000 m^3 of slightly contaminated wastes (average 36 pCi/g radium-226), whereas only land disposal is considered for the 11,000 m^3 of residues (average 67,000 pCi/g radium-226). The land and ocean disposal alternatives share similar engineering considerations, occupational and transportation risks, and radiological risks. Impacts from placement of the wastes in the ocean would be negligible. However, the land-based activities required to transport the wastes to the ocean would account for most of the potential impacts associated with the ocean disposal alternatives. Thus, the land and ocean disposal alternatives are comparable in terms of potential environmental impacts.

29340 (CONF-850314—Vol.2, pp 141-146) **Application of organic tracers in characterizing the Greater Confinement Disposal Test at the Nevada Test Site.** Olson, M.C. (Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC08-84NV10327.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Greater Confinement Disposal Test (GCDT) is a research project investigating the feasibility of augered-shaft disposal of low-level radioactive waste considered unsuitable for shallow land burial. Gaseous diffusion of radionuclides through alluvial sediments is considered the primary contaminant migration process. Volatile halocarbon tracers are released in the subsurface and their migration is monitored to determine media effective diffusion coefficients, tortuosity values, and sorption terms. Design and instrumentation of the emplacement and monitoring shafts of the disposal facility are detailed. Instrumentation includes a three-dimensional array of soil-air sample stations encircling the disposed waste. Recirculation flow lines minimize induced advection in the alluvial matrix due to tracer sample collection.

29341 (CONF-850314—Vol.2, pp 147-153) **Development of the Central Waste Disposal Facility.** Bates, L.D.; Van Hoesen, S.D. (Oak Ridge National Lab., TN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC05-84OR21400.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Central Waste Disposal Facility is a proposed facility for shallow land burial of low-level radioactive waste on the Department of Energy Oak Ridge Reservation near Oak Ridge, Tennessee. The facility development has proceeded through site characterization, facility design, assessment of environmental impacts via pathways analysis, and preparation of an environmental impact statement. The worst-case pathways analysis indicated that expected performance of the facility was within the performance goal of 25 mrem/year maximum off-site exposure as defined in the Code of Federal Regulations (10 CFR Part 61). Similar exposure calculations were also completed for an alternative aboveground disposal option. Due to comments regarding the applicability of the stated performance standard as well as related questions on the facility design, philosophy, and siting, further development of the facility has been delayed pending resolution of these issues.

29342 (CONF-850314—Vol.2, pp 155-159) **Modularized system for disposal of low-level radioactive waste.** Mallory, C.W.; DiSibio, R. (Westinghouse Hittman Nuclear Inc., Columbia, MD). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A modularized system for the disposal of low-level radioactive waste is presented that attempts to overcome the past problems with shallow land burial and gain public acceptance. All waste received at the disposal site is packaged into reinforced concrete modules which are filled with grout, covered and sealed. The hexagonal shape modules are placed in a closely packed array in a disposal unit. The structural stability provided by the modules allow a protective cover constructed of natural materials to be installed, and the disposal units are decommissioned as they are filled. The modules are designed to be recoverable in the event remedial action is necessary. The cost of disposal with a facility of this type is comparable to current prices of shallow land burial facilities. The system is intended to address the needs of generators, regulators, communities, elected officials, licensees and future generations.

29343 (CONF-850314—Vol.2, pp 163-164) **SETH 200: new mobile unit for spent ion-exchange resins embedding in polymers.** de Buzonniere, A.; Raibaud, J.; Augustin, X. (Technicatome B.P.N., Gif-sur-yvette, France). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The CEA embedding process for low- and medium-activity waste in thermosetting resins (polyester or epoxy) has been used industrially. Recent developments (elimination of chemical pretreatment thanks to a new epoxy formulation and technological breakthroughs in the operating techniques) have greatly increased the potential of the process and have allowed with Technicatome's industrial experience, the elaboration of a new mobile unit easily operated and very competitive, particularly in spent resin processing.

29344 (CONF-850314—Vol.2, pp 165-169) **Recycle operations as a methodology for radioactive waste volume reduction.** Rasmussen, G.A. (Quadrex HPS, Inc., Gainesville, FL). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The costs for packaging, transportation and burial of low-level radioactive metallic waste have become so expensive that an alternate method of decontamination for volume reduction prior to disposal can now be justified. The operation of a large-scale centralized recycle center for decontamination of selected low level radioactive waste has been proven to be an effective method for waste volume reduction and for retrieving valuable materials for unlimited use. The centralized recycle center concept allows application of state-of-the-art decontamination technology resulting in a reduction in utility disposal costs and a reduction in overall net amount of material being buried. Examples of specific decontamination process activities at the centralized facility will be reviewed along with a discussion of the economic impact of decontamination for recycling and volume reduction. Based on almost two years of operation of a centralized decontamination facility, a demonstrated capability exists. The concept has been cost effective and proves that valuable resources can be recycled.

29345 (CONF-850314—Vol.2, pp 171-176) **Stabilizing solidification I: a method of immobilization of radioactive waste involving volume reduction.** Kinoshita, K.; Kakuya, E. (Mitsubishi Heavy Industries, Ltd., Tokyo, Japan; Mitsubishi Atomic Power Industries, Inc., Omiya, Japan). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Mitsubishi Heavy Industries, Ltd. (MHI) has developed a calciner/incinerator system aiming at an integrated treatment and a large volume reduction of radioactive liquid wastes and combustible solids including spent resins, etc., generated from a nuclear power plant. It is preferable that the powdery products of calcination and incineration are treated into an immobilized form to ensure safe storage or disposal. MHI has paid attention to utilizing in-waste glass network components, such as boron oxide in the calcination products of PWR liquid wastes and silicon oxide and alumina in the incineration ashes, as a method to obtain a greater volume reduction and a long-term stability of the wastes and has confirmed that a stable vitrified product can be produced by melting these wastes at a high temperature. Furthermore, key parametric data necessary to enlarge the processing system have been obtained from a series of vitrification tests using a medium-size melter with a prospect of developing the system of practical use.

29346 (CONF-850314—Vol.2, pp 177-180) **Stabilizing solidification II: fundamental test of the waste solidification process utilizing hydrothermal reaction.** Nishihara, Yukoi; Kashiwai, Toshihiko; Yamazaki, Nakamichi. (Mitsubishi Heavy Industries, Ltd., Kobe, Japan; Mitsubishi Heavy Industries, Ltd., Takasago, Japan; Kochi Univ., Japan). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

For the purpose of developing the solidification system able to transform the powder wastes generated from the calciner (or dryer) and incinerator in the nuclear plant to the long-term stable and rigid form, the fundamental test of the hydrothermal solidification process was performed. The results are presented in this paper. From these results we obtained fair prospect of the practical use of this process.

29347 (CONF-850314—Vol.2, pp 181-186) **Operating experience of a mobile waste shredding system.** McGrath, R.N.; Volodzko, M.; Naughton, M.D. (Combustion Engineering, Inc., Windsor, CT). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The disposal of low-level radioactive waste (LLW) in the United States has become a significant problem challenging the commercial nuclear power industry. Over the past several years, there have been major changes in various aspects of LLW generation, shipment and disposal. These changes have been characterized by legislative uncertainty, more stringent regulations and increasing restrictions on shipments imposed by disposal sites and regulatory requirements. These effects have strongly impacted the current nationwide disposal system for LLW, and the industry is faced with higher shipping and disposal costs, on-site storage and soon, in some cases, no availability LLW disposal sites. The industry is responding to this problem by scrutinizing and improving the way in which LLW is managed on-site. Conventional and advanced volume reduction (VR) radwaste treatment systems are receiving more attention with both short- and long-term solutions being considered.

29348 (CONF-850314—Vol.2, pp 187-189) **Low-level volume reduction services facility.** Dam, A.S.; Bradley, M.J.; Bowles, C.R.; Brandt, R.T. (Babcock and Wilcox Co., Lynchburg, VA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Babcock and Wilcox Company is renovating the shutdown fuel fabrication facilities in Parks Township, Pennsylvania, and installing equipment to operate a Volume Reduction Services Facility for low-level radioactive waste. This facility outfitted with both an incinerator and a super-compactor will have the capability to handle dry solids, contaminated oils, liquid scintillation vials, and biological waste, and is to be the first commercial facility in the United States to utilize both incineration and super-compaction for the volume reduction of low-level radioactive waste. This paper deals with the planned operations for the Babcock and Wilcox Reduction Services Facility in Parks Township, Pennsylvania.

29349 (CONF-850314—Vol.2, pp 191-195) **Mobile liquid VR system: a cost effective alternative.** Soto, R.; Harkins, R. (Chem-Nuclear Systems, Inc., Columbia, SC; HPD, Inc., Naperville, IL). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The need for cost effective alternatives to treat large volumes of liquid radwaste has never been more evident. As part of a continuing effort to introduce such alternatives, HPD, Inc., and Chem-Nuclear Systems, Inc., have integrated two proven state-of-the-art technologies to offer a mobile liquid volume reduction system that satisfies nuclear industry requirements, with respect to liquid radwaste handling. This system optimizes proven technology by employing a crystallizer unit to concentrate the waste liquids to 50 weight percent solids, thereby reducing the volume to be solidified by factors of 40, while using only 20 percent of the energy required by conventional evaporative systems. In addition, the system employs a field proven cement solidification process which has been accepted in a Topical Report by the US NRC and which offers the highest waste to container volume ratios for stable waste forms in the industry. This volume reduction-solidification system is able to reduce over 7000 gallons of liquid waste per day to less than 30 cubic feet of 10CFR61 certified stable solidified waste for ultimate disposal or on-site storage. This document describes the GEODE System; its applicability; economics; volume reduction; scope of responsibility and experience. Major benefits include higher VR factors; assurance of continual regulatory compliance; and no capital investment.

29350 (CONF-850314—Vol.2, pp 197-200) **Volume reduction through dry active waste segregation.** Johnson, A.N. (Hydro Nuclear Services, Inc., Marlton, NJ). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Dry active waste (DAW) segregation programs offer the benefits of radioactive waste volume reduction and recovery of reusable materials, but at the same time they pose the risk of release of radioactive material to uncontrolled areas. The principal concerns of utilities in implementing segregation programs are lack of regulatory guidance and lack of confidence in clean waste monitoring techniques. These concerns are examined, and it is concluded that regulatory guidance is adequate to permit segregation programs to function; however, conventional contamination monitoring techniques may not provide adequate detection sensitivities. The basic considerations for establishing an effective segregation program are discussed: sorting and segregation, contamination monitoring, and unrestricted release criteria.

29351 (CONF-850314—Vol.2, pp 205-210) **Durasil ion exchangers: experience at Arkansas Nuclear One.** Grom, R.; Sutter, H. (Arkansas Nuclear One, Russellville; Duratek Corp., Beltsville, MD). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Durasil ion exchangers have been used for laboratory testing, an in-plant demonstration and in full-scale processing at the Arkansas Nuclear One Generating Station (ANO). The experience gained to date indicates that the Durasils should provide: (1) significant cost savings; (2) volume reductions on the order of at least a factor six over conventional organic resins; (3) reduced releases; and (4) reduced radiation exposure for personnel. These conclusions were borne out during the full-scale processing of very high conductivity waste at ANO.

29352 (CONF-850314—Vol.2, pp 211-216) **Advanced cement solidification process.** Iji, Teruo; Kodama, Hideo; Pierlas, R.; Jaouen, C.; Kuribayashi, Hiroshi; Kurumada, Norimitsu. (Kyushu Electric Power Co., Inc., Fukuoka, Japan; Societe Generale pour les Techniques Nouvelles, Saint Quentin, France; JGC Corp., Ibaraki-gun, Japan). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Advanced Cement Solidification Process, which features improved volume reductivity and properties of solidified wastes, has been developed to establish a better radioactive waste management system. Cement has been widely used as an inorganic solidification agent for the treatment of radioactive wastes generated at nuclear facilities. With current technology, borate waste solutions generated at PWR plant are neutralized with caustic soda and solidified directly with cement. This causes an increase in the volume of waste. Moreover, since borates retard the hydration of cement, the properties of solidified waste are not always such that meet the final disposal requirements. In order to eliminate these defects and to improve conventional cement solidification processes, SGN and JGC have conducted cooperative research, especially basic research on the pretreatment of borate. As a result of numerous experiments, a new process has been developed, by which solidified products with high volume reductivity and excellent physical properties can be produced. On the other hand, research and development work on a pilot plant have been carried out in cooperation with Kyushu Electric Power Co., Inc., including small scale hot tests of actual wastes at its Genkai Nuclear Power Station. A commercial-scale cold pilot plant was constructed and several proving tests have been conducted successfully.

29353 (CONF-850314—Vol.2, pp 217-225) **Radwaste drying: an engineered system for powdered and granular media.** Ritchie, J.; Allan, G. (Pacific Nuclear Systems, Inc., Federal Way, WA; Nuclear Fluids, Inc., Redmond, WA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Low-level ion exchange resins, filter media and sludges are currently dewatered or solidified prior to disposal. A waste drying system has been placed in commercial service that fully meets the regulatory requirements regarding free standing water in less than 8 hours with more volume efficient containers. The large increase in drying performance results from an engineered approach to the problem. Waste characteristics, waste container design and thermal effects were reduced to an analytic model with specific endpoints and proven with fixed tests and field operations. Not only can the amount of free standing water be predicted, but zero free standing water criteria can be confidently achieved. A patent is pending on the process and many specific aspects of the system.

29354 (CONF-850314—Vol.2, pp 227-232) **Chemical hazards from decontamination solutions in low level waste.** Leventhal, L.; Miller, A.; Turney, J.; Naughton, M. (EAL Corp., Richmond, CA; IMPELL Corp., Walnut Creek, CA; Electric Power Research Inst., Palo Alto, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Recent regulations are focussing more attention on the non-radioactive matrix materials associated with radioactive wastes. Decontamination of operating facilities is becoming a more significant source of low-level waste. This study reviewed the chemical and biological hazards of over 50 decontamination processes. Seventeen of the most prominent hard and soft decontamination processes were examined in detail. The chemical and biological hazards of these seventeen are presented in this paper. These hazards influence the choice of radwaste processing and packaging operations and methods. Federal, state and local regulations further impact on operations and waste disposal. Hazards to personnel, in plant and offsite, resulting from the decontamination cycle are evaluated. 1 fig., 5 tabs.

29355 (CONF-850314—Vol.2, pp 239-243) **Design of a modular radwaste facility.** Dillmann, C.W.; Rodriguez, L.F.; Taylor, G.E.; Weech, M.E. (General Electric Co., San Jose, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

This paper describes the design of a modular Radwaste volume reduction and solidification unit based on the AZTECH process developed and patented by the General Electric Company. 2 refs., 3 figs., 2 tabs.

29356 (CONF-850314—Vol.2, pp 245-249) **Industrial demonstration plant for granulation of simulated radioactive and toxic wastes.** Guber, W.; Zimmer, W.; Emr, A.; Kraemer, R. (F.J. Gattys Verfahrenstechnik GmbH, Neu Isenburg, Germany; Kernforschungszentrum Karlsruhe GmbH, Karlsruhe, Germany). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The paper describes an industrial demonstration plant which has been developed for the granulation of liquid wastes as well as sludges and dry fly ashes from the nuclear and non-nuclear industry. The plant is designed for a daily throughput of 15 t inactive granules, which are generated in a ploughshare mixer, using cement and bentonite or kaolin as matrix material. The green granules have to spend two days at elevated temperature and humidity in a series of hydration units. 5 refs., 4 figs., 3 tabs.

29357 (CONF-850314—Vol.2, pp 251-255) **Vitrokele compositions: novel, high affinity, metal selective and regenerable media for the removal of radioactive metals from aqueous nuclear waste streams.** Greer, C.W.; Brener, D.; Browne, E.N.C.; Holbein, B.E.; DeVoe, I.W.; Ek, R. (DeVoe-Holbein (Canada), Inc., Dorval, Quebec). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Aqueous nuclear waste streams containing various amounts of fission and activation products, together with different amounts of nonradioactive metal ions, present a significant waste disposal problem. Such streams require substantial volume reduction or treatment to high decontamination factors for their effective handling. The variable levels of activity and amounts of competing non-active metal ions present problems to the application of conventional ion exchange materials in the processing of these wastes. This paper describes new technology, the DeVoe-Holbein Technology, which provides highly efficient and effective means for handling a variety of nuclear waste streams. DeVoe-Holbein Technology consists of a novel series of synthetic (Vitrokele) compositions and various processes for their use. The compositions are highly efficient at metal capture, are selective for individual or groups of metals, allow high flow throughputs, are mechanically stable, and can be regenerated with small amounts of regenerant, solidified or vitrified directly. Field and laboratory studies with actual or simulated waste streams have demonstrated the virtual complete removal of Cs, Sr and Co from low-level wastes, while in the presence of low to high concentrations of nonradioactive competing metal ions. Systems for the in-line processing of waste streams employing capture and regeneration cycles are presented. 3 refs., 2 figs., 3 tabs.

29358 (CONF-850314—Vol.2, pp 263-265) **Design, manufacturing and commissioning of mobile unit for EDF (Dow Chemical process).** Cangini, D.; Cordier, J.P. (EDF Thermal Production Headquarters, Saint Denis, France; PEC Engineering, Osny, France). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

To process their spent ion exchange resins and the liquid wastes, EDF has ordered from PEC a mobile unit using the DOW CHEMICAL binder. This paper presents the EDF's design requirements as well as the new French regulation for waste embedding. The mobile unit was started in January 1983 and commissioned successfully in January 1985 in the TRICASTIN EDF's power plant.

29359 (CONF-850314—Vol.2, pp 299-301) **Experiences in development, qualification, and use of concrete high-integrity containers in commercial disposal of radioactive wastes.** Schmitt, R.C.; Reno, H.W. (EG and G Idaho, Inc., Idaho Falls). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Disposal of EPICOR prefilters as commercial radioactive wastes is being accomplished by using a first-of-a-kind, reinforced concrete, high-integrity container (HIC) in lieu of prior in situ solidification of resins before disposal of prefilters. Experiences in developing, testing, certifying, and using high-integrity containers are an untold story worthy of review for the benefit of the nuclear industry at large. The lessons learned in gaining regulatory acceptance of the concrete HIC are discussed. 6 refs., 1 tab.

29360 (CONF-850314—Vol.2, pp 303-307) **Volume reduction of contaminated concrete shield slabs through surface removal.** Pavelek, M.D. II; Carmel, P.G. (Bechtel National Inc., Middletown, PA; GPU Nuclear Corp., Middletown, PA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

During the TMI-2 accident, large areas of concrete surfaces were contaminated. Both unprotected concrete and concrete under protective coatings was affected. This paper describes the approach used to achieve both effective decontamination and significant radwaste volume reduction during clean-up of sixteen concrete shield slabs. The cost-benefit analysis leading to the decision to mechanically decontaminate rather than dispose of the complete slabs is discussed. Scabbling (mechanical removal of a thin layer of concrete) from approximately 2000 ft^2 of surface is described including the various equipment and methods used. Finally, the resulting post-decontamination contamination levels, the waste volumes created and the waste collection and disposal methods are discussed. 7 refs., 1 fig.

29361 (CONF-850314—Vol.2, pp 335-344) **Conceptual design for the injection of tritiated effluents into deep geological formations.** Jezierski, H.; Reuse, B. (Deutsche Gesellschaft zum Bau, Peine, Germany; Bundesministerium fuer Forschung und Technologie, Bonn, Germany). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

According to the Fourth Amendment to the German Atomic Energy Act in 1976, the Government of the Federal Republic of Germany is responsible for the establishment and operation of repositories for radioactive wastes, such as disposal facilities for tritium-containing water, coming from reprocessing plants. The Federal Government has declared that it considers the disposal of tritiated effluent in suitable, deep-lying geological formations as the preferred solution. Alternative methods are the cementing of tritium effluents for disposal and so-called in-situ solidification. The "Deutsche Gesellschaft zum Bau und Betrieb von Endlagern fuer Abfallstoffe mbH" (DBE) is on the way to design a concept for a deep-well injection facility for the disposal of tritiated effluents by order of the Federal Ministry for Research and Technology. For the injection of tritiated effluents, a deep-lying porous rock stratum is to be used, on the safety and operational requirements on corresponding systems for both surface and underground installations. From an economic standpoint, the most favorable approach involves the transport of HTO effluent via tank truck/lorry and an intermittent operation of the deep-well injection facility with a duration of about four weeks each year. Associated research and development work concerning the propagation behavior of miscible liquids in a porous medium, has revealed that the difference between the density of the tritiated effluent and that of the formation fluids exerts a considerable influence on the establishment of the displacement flood front.

29362 (CONF-850314—Vol.2, pp 377-382) **Metallographic examination of EPICOR-II liners from Three Mile Island.** McConnell, J.W., Jr.; Spaletta, H.W. (EG and G Idaho, Inc., Idaho Falls). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC07-76ID01570.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Materials from selected EPICOR-II prefilter liners were collected and examined as part of the EPICOR and Waste Research and Disposition Program sponsored by the Department of Energy at the Idaho National Engineering Laboratory (INEL). The intent of that examination was to define the internal condition of liners and ensure that liners could be stored at INEL for ten years. This paper discusses the liner-integrity examination and presents the results of these examinations. Metallurgical examination of sections removed from the liners revealed no evidence of pitting or pitting-type corrosion. Measurements of wall thickness indicate that material was missing from the wall of PF-3 in an area where the protective coating had been removed to form a conductivity patch. If it is assumed that all thinning of the wall in that area is caused by corrosion, the liners will have a lifetime of approximately 50 years.

29363 (CONF-850314—Vol.2, pp 385-386) **Testing and operation of a transportable volume reduction unit.** Rochester, D.P. (Duke Power Co., Charlotte, NC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In order to process the high volume, low specific activity liquid radwaste from the chemical cleaning of the Oconee Nuclear Station steam generators, Duke Power Company purchased a transportable volume reduction (TVR) system from Associated Technologies, Inc. Before the unit could be operated at Oconee, the system had to be functionally tested, the process optimized and simulated waste streams processed to ensure that the end product would meet burial site requirements. Although the primary objective of the unit was to process the spent cleaning solvent, the scope of the testing was expanded to include Class B and C waste levels in addition to the Class A waste from the generator cleaning. Additionally, to ensure the unit could process other waste streams if needed, waste

streams of boric acid, bead and powdered resins were tested. While all testing is not yet completed, the TVR unit has proven that it can process the various waste streams, solidify them in asphalt, and produce an acceptable burial site end product.

29364 (CONF-850314—Vol.2, pp 395-399) **Selection and evaluation of potential very low level wastes (VLLW) from nuclear power plants.** Chan, D.W.; Danna, R.; Davis, J.P.; Kaminski, M.C.; Palmer, J.A.; Palmer, J.V.; Parrish, B.R.; Oztunali, O.I. (General Physics Corp., Columbia, MD; Ebasco Corp., New York, NY). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The disposal of very low level radioactive waste (VLLW) generated at light water reactors presents a significant problem to the nuclear utility industry. The National Environmental Studies Project of the Atomic Industrial Forum has sponsored a study to develop and summarize information on VLLW to support deregulation of streams that pose a negligible hazard. This paper presents preliminary results of this study, describes the methodology used in selecting candidate streams for detailed analysis, and estimates radiation doses from disposal of these wastes. The study is divided into several sections which describe (1) the concept of regulatory cutoffs and its application to radioactive waste disposal, (2) the selection criteria for VLLW candidate streams, (3) the selection of candidate VLLW streams for study, (4) the potential disposal methods for VLLW, (5) limiting activities for various threshold dose levels, and (6) preliminary conclusions or recommendations available from the study. The results of the study described will be available as a technical document which can be used in support of a petition for exemption or rulemaking to NRC relating to a particular or generic waste stream.

29365 (CONF-850314—Vol.2, pp 401-404) **Segregation of low-level dry active waste.** Kornblith, L. Jr.; Giuffre, M.; Naughton, M. (National Nuclear Corp., Potomac, MD; The Analytic Sciences Corp., Reading, MA; Electric Power Research Inst., Palo Alto, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

This paper describes an EPRI-sponsored project to provide the technical basis for exempting some extremely lightly contaminated radioactive trash from the disposal requirements of 10CFR61. The analysis shows that TVA's Sequoyah Plant could save more than $250,000 per year if the NRC would allow them to dispose of 200 mCi/y of trash with a specific activity of less than 2 nCi/g in a nearby landfill. Only the driver of the trash hauler would receive a dose, 14 mrem/y, that was a substantial fraction of the natural variation in background radiation. Landfill workers would receive a yearly dose of less than 0.6 mrem/y; no member of the general populace would receive a measurable dose. The paper also discusses the development of procedures to ensure that the trash limits are met. This study will form the technical basis for TVA's request to NRC to grant the exemption from the 10CFR61 disposal requirements.

29366 (CONF-850314—Vol.2, pp 405-408) **Solid waste minimization at Duke Power Company.** Dameron, H.J. (Duke Power Co., Charlotte, NC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

As more nuclear stations come on line, Duke is faced with the fact of increasing solid waste volumes and increasing burial site rates. In an attempt to reduce these volumes, studies were conducted to quantify and qualify "solid waste". As each component waste type was identified, a volume reduction scheme was developed to address specific waste forms. The schemes used include administrative controls, equipment purchase and building modification, and requests for regulatory exemptions.

29367 (CONF-850314—Vol.2, pp 409-413) **Liquid radwaste minimization efforts at Duke Power Company.** Propst, R.M.; Norris, B.L. (Duke Power Co., Charlotte, NC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Most liquid radwaste processing systems are designed for "average" waste processing rates. Unfortunately, waste is not generated at this average rate but at varied rates which can overload the capacity of the systems. When the waste systems are overloaded, the operation of the entire power plant can be adversely affected. Duke Power has established a liquid radwaste minimization program designed to decrease loads on nonrecyclable waste stream process systems and to provide sufficient process capacity to handle the peak input rates in each waste stream. Elements of the program include: waste source segregation, reclamation, elimination, chemical control, leak detection, and the volume reduction of process system byproducts. Examples are given for each of these program elements. A variety of techniques are used in reducing or eliminating high-solids, high-radioactivity, and high-volume sources of waste which can overload waste systems and/or produce high volumes of byproducts for disposal. The examples illustrate that a combination of operating, engineering, and administrative tools are used to achieve the minimization program objectives.

29368 (CONF-850314—Vol.2, pp 423-426) **Modification of an existing radwaste facility to provide onsite low level waste storage.** Ault, G.M.; Reiss, J.F. (Stearns Catalytic Corp., Oak Brook, IL; Commonwealth Edison Co., Chicago, IL). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The decision of whether or not to install onsite storage capacity for low-level radioactive waste is dictated by individual utility circumstances. Commonwealth Edison has decided to construct facilities to store low-level radwaste onsite at each of their four operating nuclear stations, and they plan to have those facilities in operation by January, 1986. At Dresden, that onsite storage capacity is being provided by modifying an existing radwaste building which already has installed a remotely-operated precision-placement type crane. The purposes of this paper are to describe: (1) how Commonwealth Edison arrived at the decision to construct onsite storage facilities as a hedge against possible disruption of burial site availability in January, 1986; (2) why the desire to minimize the capital investment for this protection led to selection of an uncomplicated design for their "standard" facility and to the decision to modify an existing building at Dresden rather than construct a new one; and (3) what is being done to adapt the Dresden 1 Decontamination/Radwaste Building for extended onsite storage.

29369 (CONF-850314—Vol.2, pp 427-431) **Mobile solidification system interface design considerations.** Barcalow, J.C.; Miller, C.C. (Illinois Power Co., Clinton; Sargent and Lundy, Chicago, IL). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

This paper discusses design consideration for mobile solidification system interfaces at the Clinton Power Station. A description of the mobile interface design is presented. The details regarding the pipe routing, valve selection, and flushing provisions are included. The mobile solidification station, which centralizes all the interface requirements, is described. The control logic and new control panel are also discussed.

29370 (CONF-850314—Vol.2, pp 433-435) **Dewatering of bean and powdered resin at Three Mile Island Unit 1.** Gangwer, T. (GPU Nuclear Corp., Parsippany, NJ). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In an attempt to standardize a disposable shipping container for dewatered powdered resin and bead resin utilized at Three Mile

Island, a systematic program was developed to approve a shipping container. The container in addition to meeting the free-standing dewatering requirement of 0.5% of waste volume or one gallon, whichever is less, had to meet minimum design process capabilities of 25 gallons per minute during resin transfer operation. Specifically, the program resulted in: container definition to be used with commonly supplied casks; design and fabrication of a mobile dewatering skid; design and assembly of the dewatering internals for the container; assembly instructions and procedures for equipment operation and dewatering; procurement of hardware; equipment assembly; equipment set up and check out; and process control plan. Considerable manpower and cost benefits will be realized by having this in-house radwaste dewatering capability because vendor services will be eliminated and the quantity of radwaste liners, shipments, burial fees and burial space will be reduced.

29371 (CONF-850314—Vol.2, pp 437-440) **Solving sampling problems.** Terrell, M.S. (Duke Power Co., Charlotte, NC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The implementation of 10CFR61 and the adoption of the International Atomic Energy Agency's "Regulation for the Transport of Radioactive Materials" by the DOT require that extensive analysis be performed on the waste products that are generated by facilities which produce or utilize by-product materials. Specifically, the waste products must be analyzed to determine the presence and concentration of by-product materials. Representative samples of the waste products are necessary to perform this analysis. Most waste streams are sampled with some difficulty; however, obtaining representative samples from volume reduced waste product streams is even more difficult. Mathematical correlation models can be used to analyze these waste products, but representative sampling is still needed periodically to verify the correlations. The purpose of this paper is to share how Duke Power Company has solved the problems encountered in obtaining representative samples from items such as cartridge filters, resin slurries, and volume reduced dry product. Some of the problems we have encountered include minimizing personnel exposure, obtaining representative samples from heterogenous waste forms, transporting samples from high-rad areas to low-rad areas for retrieval and analysis, controlling the spread of contamination, adaptability to variations in process parameters and sampling new waste forms such as dry product from volume reduction equipment. Solving the problems of sampling volume reduction (VR) dry products was very challenging. Since it is basically a new waste stream, we were unable to locate a sampling device specifically designed for VR dry product. Consequently, we developed one. Our goal was to come up with a simple design that had few moving parts, required low maintenance, solved the problems listed above and was inexpensive. The details of this device are discussed.

29372 (CONF-850314—Vol.2, pp 445-451) **Fifteen years of radioactive waste management at Ontario Hydro.** Carter, T.J.; Rao, P.K.M. (Ontario Hydro, Toronto). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Ontario Hydro is a large Canadian utility producing 84% (7394 MWe) of the Nuclear Electricity generated in Canada. The low- and intermediate-level radioactive wastes generated by the Ontario Hydro program are currently being managed at the Bruce Nuclear Power Development with various volume reduction, packaging and interim storage systems. Ontario Hydro also owns and operates a radioactive waste transportation system. Studies are in progress for final disposal of these wastes in a suitable geology in Ontario. Since its inception in 1971, Ontario Hydro's radioactive waste management program has evolved into providing a full fledged radioactive waste management capability to the utility's two nuclear generation centres at Pickering and Bruce, and later in the decade, to Darlington. This paper summarizes the various developments in this program; highlights the major facilities both in-service and planned to be built; reviews the experiences gained over fifteen years of in-house waste management; and discusses the proposed reorientation towards ultimate disposal of these wastes. 2 refs., 8 figs., 1 tab.

29373 (CONF-850314—Vol.2, pp 455-463) **Overview of the applications of cement-based immobilization technologies developed at US DOE facilities.** Dole, L.R. (Oak Ridge National Lab., TN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC05-84OR21400.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

This paper briefly reviews seven cement-based waste form development programs at six of the US Department of Energy (DOE) sites. These sites have developed a variety of processes that range from producing 25-mm-(1-in.-) dia pellets in a glove box to producing 240-m-(800-ft-) dia grout sheets within the bedding planes of a deep shale formation. These successful applications of cement-based waste forms to the many radioactive waste streams from nuclear facilities bear witness to the flexibility and reliability of this class of immobilization materials. The US DOE sites and their programs are: (1) Oak Ridge National Laboratory (ORNL), Hydrofracture Grout; (2) Hanford, Transportable Grout Facility (TGF); (3) Savannah River Plant (SRP), Nitrate Saltcrete; (4) EG and G Idaho, Process Experimental Pilot Plant (PREPP); (5) Mound Laboratory (ML), Waste Pelletization Process; (6) ORNL, FUETAP Concretes; and (7) Rocky Flats Plant (RFP), Inert Carrier Concrete Process (ICCP). The major issues regarding the application of cement-based waste forms to radioactive waste management problems are also presented. These issues are: (1) leachability, (2) radiation stability, (3) thermal stability, (4) phase complexity of the matrix, and (5) effects of the waste stream composition. A cursory review of current research in each of these areas is included along with a discussion of future trends in cement-based waste form developments and applications.

29374 (CONF-850314—Vol.2, pp 465-471) **Recent hydrofracture operations at Oak Ridge National Laboratory.** Weeren, H.O.; McDaniel, E.W.; Lasher, L.C. (Oak Ridge National Lab., TN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC05-84OR21400.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The hydrofracture process is currently being used at Oak Ridge National Laboratory (ORNL) for the permanent disposal of locally generated radioactive waste solutions and slurries. In this process, the waste solution or slurry is mixed with a blend of cement and other solid additives; the resulting grout is then injected into an impermeable shale formation at a depth of 200 to 300 m (700 to 1000 ft). The grout sets a few hours after completion of the injection, fixing the radioactive waste in the shale formation. A new facility was commissioned in 1982 at a site adjacent to the original facility. Between June 1982 and January 1984, more than 8 million L (2.2 million gal) of waste containing over 750,000 Ci was mixed with a blend of solids and injected. Various operating problems were experienced and solved.

29375 (CONF-850314—Vol.2, pp 473-480) **Geology of the host formation for the new hydraulic fracturing facility at Oak Ridge National Laboratory.** Haase, C.S.; Stow, S.H.; Zucker, C.L. (Oak Ridge National Lab., TN; University of Tennessee, Knoxville). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC05-84OR21400.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Liquid low-level radioactive wastes are disposed of at Oak Ridge National Laboratory (ORNL) by the hydrofracture process. Wastes are mixed with cement and other additives to form a slurry that is injected into a low permeability shale at 300-m depth. Important properties for a host shale formation at a hydrofracture facility include: (1) predictable fracture behavior; (2) hydrologic isolation; and (3) favorable mineralogy and geochemistry to retard radionuclide migration and enhance grout stability. The stratigraphy, petrology, diagenesis, structural geology, and hydrology of the Pumpkin Valley Shale host formation at the ORNL site are summarized and discussed in light of these three properties. Empirical data from hydrofracture operations at ORNL over the past 25 years suggest that many aspects of the Pumpkin Valley Shale make it favorable for use as a host. This observation agrees with analysis of

several aspects of the Pumpkin Valley Shale geology at the ORNL site. Although presently available data suggest that the permeability of the Pumpkin Valley Shale is low and that it should provide sufficient hydrologic isolation, more data are needed to properly evaluate this aspect of host formation performance.

29376 (CONF-850314—Vol.2, pp 481-485) **Monitoring of surface deformation and microseismicity applied to radioactive waste disposal through hydraulic fracturing at Oak Ridge National Laboratory.** Stow, S.H.; Haase, C.S.; Switek, J.; Holzhausen, G.R.; Majer, E. (Oak Ridge National Lab., TN; Applied Geomechanics, Inc., Santa Cruz, CA; Lawrence Berkeley Lab., CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC05-84OR21400.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Low-level liquid nuclear wastes are disposed of at Oak Ridge National Laboratory by the hydrofracture process. Wastes are mixed with cement and other additives to form a slurry that is injected into shale of low permeability at 300 m depth. The slurry spreads radially along bedding plane fractures before setting as a grout. Different methods for monitoring the location and behavior of the fractures have been investigated. Radioactive grout sheets can be located by gamma-ray logging of cased observation wells. Two other methods are based on the fact that the ground surface is deformed by the injection. The first entails surface leveling of a series of benchmarks; uplift up to 2.5 cm occurs. The second method involves use of tiltmeters that are sensitive and measure ground deformation in real time during an injection. Both methods show subsidence during the weeks following an injection. Interpretive models for the tiltmeter data are based on the elastic response of isotropic and anisotropic media to the inflation of a fluid-filled fracture. A fourth monitoring method is based on microseismicity. Geophone arrays were used to characterize the fracture process and to provide initial assessment of the feasibility of using seismic measurements to map the fractures as they form. An evaluation of each method is presented.

29377 (CONF-850314—Vol.2, pp 487-491) **Cementation of radioactive wastes in the Federal Republic of Germany.** Koester, R. (Kernforschungszentrum Karlsruhe GmbH, Germany). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The cementation of solid and liquid raw wastes as well as of waste concentrates to produce solid products has been a well established technique for many years. Cementation will also be the method for the fixation of cladding hulls, dissolver residues, evaporator low-level and intermediate-level waste concentrates and solid wastes arising from the planned 350 MTHM/year reprocessing plant. The cementation techniques used are discussed briefly. They include in-drum mixers, rotating containers with pebbles or mixing installations and continuously operating cementation mixers. The influence of organic compounds in the waste solutions on the hardening process is discussed. Basic data on product properties like mechanical stability, chemical stability (corrosion, leaching) and radiation stability are presented on the basis of laboratory and full scale unit investigations. Main objective of the work is to establish source term formulations as input functions for safety analysis for the radionuclide mobilization via gas phase after mechanical or thermal impacts. In order to evaluate source terms for the mobilization of relevant radionuclides via liquid phase as a function of time due to leaching and corrosion, detailed experimental and theoretical investigations of processes occurring when cemented waste forms are in contact with salt brines were carried out. Recent developments concerning improvements of existing cementation methods and the increasing significance of waste container application along with a newly developed standardized container system are presented. The conclusion can be drawn that the present FRG cementation technology is adequate for the wastes from nuclear power reactor operation and the solid and liquid LL and IL wastes from the reprocessing plant. There is a demand to improve waste products due to economic and safety considerations especially for wastes of higher alpha-activity like dissolver residues or burnable materials.

29378 (CONF-850314—Vol.2, pp 493-496) **Recent experiences with cement solidification systems.** Brunner, H.; Christ, B. (NUKEM GmbH, Hanau, Germany; TRANSNUKLEAR, Hanau, Germany). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Recent developments and experiences with cement solidification systems are concerned with modified in-drum mixers (DEWA and MOWA) for solidification of evaporator concentrates, sludges, dry filter residues and stationary or mobile continuous mixing systems. Plants and processes are described including throughputs, dose rates, radiation exposure of the staff and product qualities obtained. The data are based on more than 2800 drums, mainly produced in the years 1983 and 1984. 11 refs., 2 figs., 1 tab.

29379 (CONF-850314—Vol.2, pp 497-501) **Operational and long-term performance assessment for Hanford grout.** Treat, R.L.; Lokken, R.O.; Stein, S.L.; Geffen, C.A. (Pacific Northwest Lab., Richland, WA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC06-76RL01830.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Department of Energy and Rockwell Hanford Operations are preparing for the construction of a Transportable Grout Facility to immobilize selected radioactive liquid wastes now stored at Hanford. Oak Ridge National Laboratory is supporting the program by developing initial grout formulations for the facility. Pacific Northwest Laboratory is verifying the required operational characteristics of the grout formulation and evaluating the long-term performance of the grouted waste form. Preliminary assessments of the operational characteristics of the grout formulation show that the grout meets established criteria. Preliminary performance assessments indicate that the grouted waste form will provide long-term environmental protection. A series of laboratory and field tests are planned and ongoing to verify these assessments.

29380 (CONF-850314—Vol.2, pp 503-508) **Development of a grout-based stabilization method for spent high-temperature gas-cooled reactor fuel.** Wilbourn, R.G.; Zimmerman, R.D. (GA Technologies, Inc., San Diego, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The preliminary results of a study of potential predisposal stabilization methods for spent high-temperature gas-cooled reactor (HTGR) fuel are presented. The paper comprises (1) methods for reducing the volume of fuel prior to disposal, (2) an assessment of existing stabilization methods for use with spent HTGR fuel, (3) development of a potential reference HTGR fuel stabilization flowsheet, and (4) the results from laboratory preparation and testing of concrete stabilized, simulated HTGR fuel waste forms.

29381 (CONF-850314—Vol.2, pp 511-512) **Mobile incineration services at Commonwealth Edison's nuclear stations.** Smith, K.R. (Aerojet Energy Conversion Co., Rancho Cordova, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

As the costs for low-level waste disposal escalate, and as the January 1, 1986 date draws nearer, utilities throughout the United States are formulating and implementing plans to reduce the volumes of the low-level radioactive waste being generated at their nuclear power stations. Techniques being used to accomplish this goal range from sorting of dry active waste to complete volume reduction systems, like the Aerojet VR Systems being installed at Commonwealth Edison's Byron and Braidwood Stations. In between these extremes are partial solutions to the problem, including compaction, shredding and compaction, super-compaction, resin dewatering, liquid drying, and now, mobile incineration. In June, 1983, Commonwealth Edison Company (CECO) of Chicago, Illinois, contracted Aerojet Energy Conversion Company (AECC) of Sacramento, California, to supply mobile VR services to the Dresden,

La Salle, Quad Cities, and Zion Nuclear Stations. Per the contract, AECC is responsible for the design, fabrication, delivery, operation, and maintenance of a Mobile Volume Reduction System (MVRS) capable of processing combustible dry active waste and contaminated oil generated at these Com-Ed facilities. Initial commercial operation of the MVRS is planned for the Dresden Nuclear Power Station in May, 1985. This paper is intended to summarize some of the key elements resulting from the design, fabrication, and testing of the MVRS. In addition, it is intended to identify the tasks a potential user of the MVRS service must complete in order to receive permission from the Nuclear Regulatory Commission to operate the MVRS at their site.

29382 (CONF-850314—Vol.2, pp 513-515) **DAW volume reduction (VR) using the newly developed 20 MN (2200 tons) SUPERPACK: a new generation of supercompactor equipment.** Baudisch, H.; Szukala, M.; Miller, H.; Sathrum, C.; Karow, F.; Grewe, K. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A high performance supercompactor using a unique patented design to reduce size and cost with improved performance will be described. Results of a waste reduction campaign in a nuclear power plant will be presented. During a backfitting campaign from September 1982 to September 1983, the Brunsbuttel Nuclear Plant located in West Germany, produced approximately 100 tons of pressable waste, which was all precompacted in more than 4000 caustic soda drums of 180 liters each (47.5 US gallons). Some 2365 of these drums have been transformed into 658 drums of 55 gallon content using a very novel development: the 20 MN SUPERPACK of Hansa-Projekt (HP), serviced by INET Corporation in the United States. SUPERPACK is a space and cost saving solution for waste management, fulfilling all safety requirements. The SUPERPACK used in Brunsbuttel gave a volume reduction factor (VRF) of 3.6 for drums which were precompacted by a factor of about four. These results are based on an experience of more than 4000 pressed drums. This is a very cost effective low level waste management technique; the equipment cost was amortized in less than one year. Availability of the system was better than 95% during its first year of operation. 1 fig., 1 tab.

29383 (CONF-850314—Vol.2, pp 517-522) **Volume reduction of dry active waste: the mobile service option.** Zigelman, D.A.; Mis, F.J. (Westinghouse Hittman Nuclear Inc., Columbia, MD; Rochester Gas and Electric Co., Ontario, NY). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Dry activated waste (DAW) produced at nuclear power plants accounts for the largest fraction of the radioactive waste volume generated and shipped for burial. Since burial of this waste is charged on a dollar per cubic foot basis, the application of advanced volume reduction techniques to DAW merits attention to reduce a plant's burial costs. This paper addresses the mobile high force compaction service option as an economic alternate to capital expenditures for purchase of volume reduction equipment. 7 figs., 2 tabs.

29384 (CONF-850314—Vol.2, pp 523-528) **Operating experience with a dry active waste shredder/compactor at a nuclear power plant.** Henderson, J.D.; Boyd, M.A.; Marshall, R.W. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Dry active waste (DAW) produced at nuclear power plants generally accounts for a large portion of the total low-level radioactive waste shipped for disposal at shallow land burial sites. Dry active waste generally consists of paper, cloth, scrap wood, light metals, sheet plastics and other miscellaneous items. Most nuclear plants package the compactible waste with either a drum or box compactor. Noncompactible waste is packaged in either metal or wooden boxes. The shredder/compactor system was developed to shred normally bulky noncompactible waste and thus make it capable of being compacted into an LSA box with other compactible waste. The result is the elimination of void spaces, reduced springback tendency, and an increase in the density of the waste which can be compacted into a box. Carolina Power and Light Company installed a shredder/compactor system developed by Impell Corporation at the Brunswick Steam Electric Plant in October 1984. This paper describes the shredder/compactor system, the performance of the system using a simulated EPRI waste mixture, the system performance using a simulated Brunswick plant DAW mixture, system operating experience, a discussion on overall plant DAW waste minimization and reaches the conclusion that the shredder/compactor system is a cost effective and efficient technique for processing and achieving dry active waste volume reduction for typical BWR plant waste. 1 fig., 3 tabs.

29385 (CONF-850314—Vol.2, pp 529-537) **Commercial regional incinerator facility for treatment of low-level radioactive waste.** Sauer, R.E.; Jessop, D. (US Ecology, Inc., Louisville, KY; Associated Technologies, Inc., Charlotte, NC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In 1981, US Ecology, Inc. began studies on the feasibility of constructing and operating a regional radioactive waste incinerator facility. In December, 1982, US Ecology requested turnkey quotations from several vendors for engineering, procurement, and construction of the new facility. After technical and commercial evaluations, a contract was awarded to Associated Technologies, Inc., of Charlotte, North Carolina, in June, 1983. In June, 1984, US Ecology made a public announcement that they were studying two sites in North Carolina for location of the facility. This same month, they submitted their permit application for a radioactive material license to the North Carolina Department of Human Resources. The facility will accept wastes from power reactors, medical and research institutions and other industrial users, and will incinerate dry solid waste, pathological waste, scintillation fluids, and turbine oils. The incinerator will be a dual chamber controlled air design, rated at 600 lbs/h, with a venturi scrubber, packed column, HEPA, and charcoal filters for pollution control. The stack will have a continuous monitor. 4 figs.

29386 (CONF-850314—Vol.2, pp 539-542) **Comparison between mobile VR services and central VR service facility for dry active waste.** Dam, A.S.; Bradley, M.J. (Babcock and Wilcox Co., Lynchburg, VA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Low-level radioactive dry wastes can be volume reduced using either mobile or central facilities with super-compactors, or incinerators, or both. This paper compares the technical, operational and economic factors for mobile versus central facilities. Analyses indicated that customer costs, in addition to the service vendors' fee, are a significant factor in the evaluation of mobile services. The most attractive option is a central facility offering both incineration and super-compaction.

29387 (CONF-850314—Vol.2, pp 545-549) **Operational experience of the Palisades volume reduction system: the first 12 months.** Neal, T.P.; Miller, C.C.; Naughton, M.D. (Consumers Power Co., Covert, MI; Sargent and Lundy, Chicago, IL; Electric Power Research Inst., Palo Alto, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The operating experience of the first extruder-evaporator volume reduction and solidification system in the United States is discussed. The performance of the system during its first year of operation is presented. The labor and maintenance requirements for the system during the first year are also discussed. 5 figs.

29388 (CONF-850314—Vol.2, pp 551-554) **Transport, installation, and testing of a transportable volume reduction and bitumen solidification system.** Jones, K.B.; Schavey, T.W.; Schumpert, D.E. Jr.; Snow, A.L. (Duke Power Co., Charlotte, NC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Review of the Transportable Volume Reduction/Radioactive Waste Solidification System (TVR) shows that the fabrication of the system meets the Duke contract specifications and current regulatory requirements and that the system has successfully demonstrated its ability to solidify boric acid, EPRI chemical cleaning solvent, and demineralizer resin wastes in asphalt. Review of disassembly, transport and reassembly reveals the TVR System's flexibility to move in and out of a station without undue impact on station personnel. Modification of the plant for TVR installation is easily accomplished upon conducting a comprehensive review of design considerations; a discussion is given of the actual coordination, design, and construction applied in modifying Duke Power Company's Riverbend Steam Station. Initial results are presented from processing boric acid, chemical cleaning, and demineralizer resin wastes which show that this system is capable of volume reducing and solidifying the wastes. 3 refs.

29389 (CONF-850314—Vol.2, pp 555-560) **Evaluation of the miscellaneous waste evaporator at Rancho Seco.** Best, W.T.; Turney, J.H.; Gardiner, D.E. (Impell Corp., Walnut Creek, CA; Sacramento Municipal Utility District, Herald, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In June 1984, Sacramento Municipal Utility District gave Impell Corporation the authority to proceed with an evaluation of the operation of the miscellaneous waste evaporator. The purpose of the evaluation was to optimize the operation of the evaporator with the intent to simplify and reduce the cost of waste handling within the plant. This paper analyzes on a cost basis, several suggested solutions to achieve the above.

29390 (CONF-850314—Vol.2, pp 561-568) **Aeroject fluidized bed volume reduction system operation and licensing.** Garcia, R.; Anderson, R.E. (Aerojet Energy Conversion Col., Sacramento, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In July 1978, the Aerojet Energy Conversion Company (AECC) was awarded a contract by Commonwealth Edison Company to deliver two fluidized bed Volume Reduction (VR) systems for processing the low-level radioactive wastes at its Byron and Braidwood Nuclear Stations. The AECC VR System for Byron is fully installed and successfully completed its Acceptance Test in September 1984. In that test three nonradioactive liquid wastes, dry wastes, and oil were processed to effect a major volume reduction of the incoming waste streams. All five waste streams were processed at rates that exceeded the specification value by at least 10%. The system processed the various waste streams for 108 h during the Acceptance Test. The VR System also successfully passed a series of fifteen start and stop tests. As a result of the successful test operation, Commonwealth Edison Company accepted the system for operation at the Byron Station. AECC supported the utility licensing effort by filing a Topical Report with the United States NRC in October 1979. After an extensive review period concluded in November 1984, the NRC accepted the Topical Report and its amendments as a referencing document in utility licensing applications. Meanwhile, Commonwealth Edison Company referenced this Topical Report in an Amendment to the Byron FSAR in May 1982. After responding to plant-specific questions raised by the NRC, Commonwealth Edison Company obtained NRC approval for full-power operation of the Byron Station and to operate the AECC VR System on plant wastes on February 12, 1985. Commonwealth Edison Company also obtained a permit to operate the VR System from the state of Illinois. The successful Acceptance Test of the AECC VR System and the NRC approval to operate the VR System on plant-generated wastes clearly demonstrates the applicability and licensability of fluidized bed volume reduction systems for processing low-level radioactive wastes.

29391 (CONF-850314—Vol.2, pp 569-571) **Liquid radwaste processing, operational experience utilizing Duratek Mobile Process System (MPS).** Hunkele, W.; Jensen, C.E. (Public Service Electric and Gas, Hancock's Bridge, NJ; Duratek Corp., Beltsville, MD). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The use of Duratek's Mobile Process System (MPS) employing sluiceable pressure vessels and improved operational techniques generates operational efficiencies including volume reduction (VR), reduced personnel labor and exposure and higher flowrates for cleanup of liquid radwaste streams in an operating nuclear power plant (Salem Generating Station). Significant additional VR is achievable based on laboratory and on-site experience utilizing Durasil 70. Under high conductivity, actual waste stream conditions, this proprietary media has demonstrated through-puts of a magnitude 15 times higher than organic cation resin. A long-term problem, cobalt species removal, is mitigated by this media.

29392 (CONF-850314—Vol.2, pp 573-578) **Radwaste ion-exchange optimization.** Jacob, N.P.; Morgan, E.; Storton, J.M.; Kramer, J.F.; Ewing, K.C.; Kangley, J.P.; Naughton, M.D. (Babcock and Wilcox, Lynchburg, VA; Millstone Nuclear Station, Waterford, CT; Electric Power Research Inst., Palo Alto, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Increased volume reduction factors for radwaste liquid treatment and reduced costs for ion-exchange media replacement and disposal have been key driving forces for nuclear utilities to seek optimal performance from radwaste liquid ion-exchange treatment systems. This paper presents the methodology and the results of an EPRI/B and W project to identify optimal radwaste ion-exchange processing schemes that will provide cost savings for nuclear plant operators. The focus in this paper will be on the findings of both in-plant bench scale and prototype ion-exchange column tests using radwaste liquid generated at the Millstone Nuclear Station. 1 ref., 4 figs.

29393 (CONF-850314—Vol.2, pp 587-591) **Estimates of secondary waste production from operations at a proespective geologic repository in tuff.** Engelhard, M.P.; Jardine, L.J. (Bechtel National, Inc., San Francisco, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In this paper, a method is outlined for estimating the volumes of solid and liquid radioactive wastes produced during the operation of a repository in tuff. Volume estimates were also developed based on a preliminary conceptual facility design. Based on a disposal rate of 3000 MTU/y of commercial spent fuel, the waste estimates ranged from 793 to 2464 m^3/y of uncompacted solids and from 80,431 to 128,690 L/y of liquids, depending on the specific set of facility features assumed. The estimates of waste quantities were most dependent on variations in the ratio of truck to rail cask shipments received. The quantities of waste generated on site decreased as this ratio decreased. Although there are large uncertainties in the current estimates caused by the preliminary nature of the facility designs and the limited amount of engineering detail completed, the methodology can be used to refine estimates as the repository design progresses.

29394 (CONF-850314—Vol.2, pp 593-596) **Slurry growth: the characterization of a unique phenomenon at the Hanford Site.** Jansky, M.T. (Rockwell Hanford Operations, Richland, WA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Slurry growth, unique to the Hanford Site, is a significant increase in the volume of waste contained in a waste storage tank

without the addition of new waste. Slurry growth is caused by gas entrapment within waste slurries which causes the slurry to swell, like bread dough. The surface of the slurry rises until either gas pressure is great enough or the weight of the slurry over the gases is great enough to cause the surface of the slurry to collapse. The gases causing slurry growth are generated from decomposition of organics present in high-level nuclear waste (HEDTA, EDTA, GLY). Predominant gases are H_2, N_2, N_2O, NO/sub x/, and CO_2. More gas is generated, and at a faster rate, as the temperature increases. Slurry growth, although not completely eliminated, is being safely and effectively controlled. The parameters affecting slurry growth have been defined, and predictive equations have been established. The knowledge gained through laboratory experiments contributes to continued safe and efficient high-level waste management practices at the Hanford Site.

29395 (CONF-850314—Vol.2, pp 597-601) **Estimating waste disposal quantities from raw waste samples.** Negin, C.A.; Urland, C.S.; Hitz, C.G. (Grove Engineering, Inc., Washington Grove, MD; GPU Nuclear Corp., Middletown, PA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Estimating the disposal quantity of waste resulting from stabilization of radioactive sludge is complex because of the many factors relating to sample analysis results, radioactive decay, allowable disposal concentrations, and options for disposal containers. To facilitate this estimation, a microcomputer spread sheet template was created. The spread sheet has saved considerable engineering hours. 1 fig., 3 tabs.

29396 (CONF-850314—Vol.2, pp 603-609) **Analytical characterization of West Valley high-level waste sludge.** Rykken, L.E.; Wilson, J.A.; Hardt, T.L. (West Valley Nuclear Services Co., Inc., NY; Babcock and Wilcox, Lynchburg, VA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The major portion of the West Valley waste is stored in a 2.7 million-liter capacity underground steel storage tank. Neutralization of the PUREX process effluent resulted in precipitation of an insoluble sludge which settled to the bottom of the tank. The radioactivity is split approximately 50/50 between the alkaline supernatant (primarily ^{137}Cs) and the sludge solids (primarily ^{90}Sr). The supernatant will be processed by an ion exchange process to remove the cesium, producing a low-level liquid waste which will be evaporated down and solidified in concrete. The sludge solids will be washed in-tank, blended with the cesium-loaded ion exchange media, glass formers, and a small volume of acidic (THOREX process) waste stored separately, and fed to a Slurry-Fed Ceramic Melter for melting into a borosilicate glass form. A core sample of the sludge solids was taken in the fall of 1983 as part of an overall Waste Characterization Program. Small quantities (0.1 to 0.8 g) of samples from eight vertical horizons in the 0.4 m sludge layer were analyzed. The results indicate that the sludge composition is relatively uniform throughout the tank since the probability of taking a sample representing an "average concentration" if there were substantial variation would be extremely low. Unique analytical techniques used to obtain the data, as well as implications regarding sludge washing, mobilization, and vitrification are presented.

29397 (CONF-850314—Vol.2, pp 611-619) **Status of the waste removal system for the West Valley Demonstration Project.** Schiffhauer, M.A.; Groth, J.T.; Scott, D.W. (West Valley Nuclear Services Co., Inc., NY; Rockwell Hanford Operations, Richland, WA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Development work is progressing to identify a Mobilization System for the removal of the sludge layer of the neutralized PUREX High-Level Waste (HLW) and cesium loaded zeolite from complex storage tanks at the West Valley site. Equipment is simulated at a reduced scale, and examined in a One-sixth Scale Model of the West Valley HLW storage tanks. Sludge characterization data has been used to formulate a simulant sludge matching the yield strength of the actual PUREX sludge phase. Experimental results predicting the removal efficiencies of the methods examined to date are reported. The West Valley waste removal development program, conceptual design of the overall HLW removal system and its processing steps to the Slurry-Fed Ceramic Melter (SFCM) for vitrification, planned remote tank modification, and status of the waste removal project are discussed.

29398 (CONF-860610—11) **Version of ORIGEN2 with automated sensitivity-calculation capability.** Worley, B.A.; Wright, R.Q.; Pin, F.G. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86006123.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

ORIGEN2 is a widely used point-depletion and radioactive-decay computer code for use in simulating nuclear fuel cycles and/or spent fuel characteristics. The code calculates the amount of each nuclide being considered in the problem at a specified number of times, and upon request, a database of conversion factors relating mass compositions to specific material characteristics is used to calculate and print the total nuclide-dependent radioactivity, thermal power, and toxicity, as well as absorption, fission, neutron emission, and photon emission rates. The purpose of this paper is to report on the availability of a version of ORIGEN2 that will calculate, on option the derivative of all responses with respect to any variable used in the code.

29399 (CONF-8509121—) **Proceedings of the seventh annual participants' information meeting. DOE Low-Level Waste Management Program.** (EG and G Idaho, Inc., Idaho Falls (USA)). Feb 1986. Contract AC07-76ID01570. 927p. NTIS, PC A99/MF A01; 1; GPO Dep. File Number DE86010152.

From 7. annual DOE LLWMP participants information meeting; Las Vegas, NV, USA (10 Sep 1985).

The Seventh Annual Department of Energy (DOE) Low-Level Waste Management Program (LLWMP) Participants' Information Meeting was held September 10-13, 1985 in Las Vegas, Nevada. The purpose of the meeting was to provide a forum for exchange of information on low-level radioactive waste management activities, requirements, and plans. Attendees included representatives from the DOE Nuclear Energy and Defense Low-Level Waste Management Programs, interim operations offices and their contractor operators; representatives from the US Nuclear Regulatory Commission, US Environmental Protection Agency, US Geological Survey, and their contractors; representatives of states and regions responsible for development of new commercial low-level waste disposal facilities; representatives of Great Britain, France, and Canada; representatives of utilities, private contractors, and parties concerned with low-level waste management issues. The meeting was organized by topical areas to allow for the exchange of information and the promotion of discussion on specific aspects of low-level waste management. Plenary sessions were held at the start and conclusion of the meeting while seven concurrent topical sessions were held during the intervening day and a half. Session chairmen from each of these concurrent sessions presented a summary of the discussion and conclusions resulting from their respective sessions at the final plenary session.

29400 (DOE/NE/44352—1) **Massachusetts Crystalline Repository Project. Progress report, December 31, 1985.** (Massachusetts Dept. of Public Health, Boston (USA)). 1985. Contract FG02-83NE44352. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009868.

Project activities which have been undertaken include the following: review and comment on OCRD projects reports; review of pertinent DOE, NRC, EPA, and DOT quidelines and regulations; review of reports and maps released by the federal project group and contractors; attendance at DOE workshops and conferences; implementation of state-specific research activities; interaction with representatives of federal agencies and other participating states; and interface with media, state officials and legislators, and interested citizens.

29401 (GS-CIRC—79) Geologic disposal of high-level radioactive wastes: Earth-science perspectives. Bredehoeft, J.D.; England, A.W.; Stewart, D.B.; Trask, N.J.; Winograd, I.J. (Geological Survey, Washington, DC (USA)). 1985. 20p. (LC—78-600019). NTIS, PC A02/MF A01.

The long term storage of radioactive waste and its geological, biological, physical, and chemical effects are considered. The development of acceptable waste repositories are outlined: (1) identification of sites that meet broad criteria for tectonic stability, slow ground-water movement, and long flow paths to the surface; (2) intensive subsurface exploration of such sites to determine the hydrologic and geologic conditions in and around the potential repository; (3) predictions of repository behavior based on the initial conditions and on various assumptions about the future; (4) evaluation of the risk associated with these predictions; and (5) a judgement whether these risks are acceptable. Some of the key earth-science questions involved in the first four steps are discussed.

29402 (Juel—2010) Solidification of enriched tritium from reprocessing. Ebeling, N. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie der Nuklearen Entsorgung; Technische Hochschule Aachen (Germany, F.R.)). Aug 1985. 179p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751631.

During reprocessing of spent fuel elements from LWR tritium containing waste water is produced. Studies have proved that it is possible to enrich the tritium from the waste water to about 10 m^3/a hydrogen gas by e.g. electrolysis and catalytic exchange. Possibilities are studied for the fixation of tritium containing hydrogen gas as a hydride/tritide in zirconium or titanium sponge and final disposal of the product in a repository. On the basis of small scale laboratory experiments a concept for a technical TRItium FIXation plant "TRIFIX" is developed. It is shown that the mechanical and thermal properties of the reaction product zirconium hydride are sufficient for final disposal. Experiments with small amounts of tritium prove that the loaded metal sponge is resistant against leaching and degassing. Semi-empirical equations are developed for describing the loading reaction as well as the degassing and leaching behaviour of the metal hydride/tritide.

29403 (LA—10449-MS) Subsurface moisture regimes and tracer movement under two types of trench-cap designs for shallow land burial sites. Perkins, B.A.; Cokal, E.J. (Los Alamos National Lab., NM (USA)). Mar 1986. Contract W-7405-ENG-36. 97p. NTIS, PC A05/MF A01; GPO Dep. File Number DE86009797.

The Los Alamos work has focused on proper design of shallow land burial (SLB) sites in arid and semiarid regions and on applying corrective measures to existing sites. One of the most important design features affecting the probability of movement of radionuclides in SLB sites is the type of trench cap placed over the waste. The cap influences such interdependent parameters as erosion, water infiltration and percolation, and biointrusion. To obtain experimental data for arid and semiarid sites, two different designs of trench caps, one with topsoil underlain with a cobble/gravel biobarrier and one with topsoil underlain with crushed tuff, were compared with respect to (1) seasonal changes in volumetric soil water content, and (2) downward migration of tracers emplaced directly below each type of trench cap. The causes for the large differences in concentrations found in this experiment need to be investigated further. Problems in environmental modeling and monitoring of arid and semiarid SLB sites because of heterogeneities in the soil profiles and their implications for SLB waste management need to be better understood. More work in trench-cap design and its influence on the many pathways available for mobilization is needed.

29404 (LA—10574-MS) Technology development for the design of waste repositories at arid sites: field studies of biointrusion and capillary barriers. Nyhan, J.W.; Abeele, W.; Hakonson, T.; Lopez, E.A. (Los Alamos National Lab., NM (USA)). Mar 1986. Contract W-7405-ENG-36. 51p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009793.

The field research program involving the development of technology for arid shallow land burial (SLB) sites is described. Results of field testing of biointrusion barriers installed at an active low-level radioactive waste disposal site (Area G) at Los Alamos are presented. A second experiment was designed to test the ability of a capillary barrier to effectively convey water infiltrating a SLB trench around and away from underlying buried wastes. The performance of the capillary barrier was tested in the field for a barrier of known thickness (2 m), slope (10%), and slope length (2 m), and for one combination of porous materials [a crushed tuff-clay (2% w/w) mixture overlying Ottawa sand] subjected to a known water addition rate. The waste management implications of both studies are also discussed.

29405 (LBL—20738) Heat pipe effects in nuclear waste isolation: a review. Doughty, C.; Pruess, K. (Lawrence Berkeley Lab., CA (USA)). Dec 1985. Contract AC03-76SF00098. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009265.

The existence of fractures favors heat pipe development in a geologic repository as does a partially saturated medium. A number of geologic media are being considered as potential repository sites. Tuff is partially saturated and fractured, basalt and granite are saturated and fractured, salt is unfractured and saturated. Thus the most likely conditions for heat pipe formation occur in tuff while the least likely occur in salt. The relative permeability and capillary pressure dependences on saturation are of critical importance for predicting thermohydraulic behavior around a repository. Mineral redistribution in heat pipe systems near high-level waste packages emplaced in partially saturated formations may significantly affect fluid flow and heat transfer processes, and the chemical environment of the packages. We believe that a combined laboratory, field, and theoretical effort will be needed to identify the relevant physical and chemical processes, and the specific parameters applicable to a particular site. 25 refs., 1 fig.

29406 (MLM—3332, pp 15-19) **Low temperature distillation system for tritium recovery.** Embury, M.C. 28 Jan 1986. NTIS, PC A03/MF A01. File Number DE86007083.

In Tritium control, October 1984-September 1985.

A low temperature (24 K) distillation system for recovering tritium from mixtures of hydrogen isotopes has been installed at Mound as the main component of the Hydrogen Isotope Separation System (HISS). The HISS will handle feed mixtures containing all six molecular species of hydrogen (H_2, HD, HT, D_2, DT, T_2) and impurities (He, Ar, CO_2, air) and will enrich the tritium while producing a stackable raffinate. A gas handling system designed and built at Mound receives the gaseous feeds, assays the tritium, removes the non-hydrogen species, and blends batches of gas to feed to the distillation system. The distillation system was designed and built by Arthur D. Little, Inc. to handle feeds containing a wide range of tritium concentrations and yield a bottom stream containing greater than 90 at. % tritium. The HISS is currently in startup; integrated system testing is scheduled in March 1986.

29407 (MLM—3332, pp 19-24) **Management of high specific activity tritiated liquid wastes.** Colvin, C.M.; Gibbs, G.E. 28 Jan 1986. NTIS, PC A03/MF A01. File Number DE86007083.

In Tritium control, October 1984-September 1985.

The drum study monitoring the release of tritium from actual burial packages continued. Fractional release values for three types of waste packaging are compared, and data are presented showing total permeation over time.

29408 (NUREG—1188) Auburn Steel Company radioactive contamination incident. Bradley, F.J.; Cabasino, L.; Kelly, R.; Awai, A.; Kasyk, G. (New York Dept. of Labor, Brooklyn (USA). Radiological Health Unit). Apr 1986. 35p. NTIS, PC A03/MF A01 - GPO. File Number TI86901300.

On February 21, 1983, workers at the Auburn Steel Company, Auburn, New York discovered that about 120 tons of steel poured that day had become contaminated with ^{60}Co. In addition to the steel, the air cleaning system and portions of the mill used in casting the steel were contaminated. Approximately 25 curies of ^{60}Co were involved. Decontamination and disposal of the contamination cost in excess of $2,200,000. This report details the discovery

of the contamination, decontamination of the plant and disposal of the contamination.

29409 **(ORNL/TM—9680-Pt.2) Fixation of waste materials in grouts. Part II. An empirical equation for estimating compressive strength for grouts from different wastes.** Tallent, O.K.; McDaniel, E.W.; Godsey, T.T. (Oak Ridge National Lab., TN (USA)). Apr 1986. Contract AC05-84OR21400. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010075.

Compressive strength data for grouts prepared from three different nuclear waste materials have been correlated. The wastes include ORNL low-level waste (LLW) solution, Hanford Facility Waste (HFW) solution, and Hanford cladding removal waste (CRW) slurry. Data for the three wastes can be represented with a 0.96 coefficient of correlation by the following equation: S = -9.56 + 9.27 D/I + 18.11/C + 0.010 R, where S denotess 28-d compressive strength, in mPa; D designates Waste concentration, fraction of the original; I is ionic strength; C denotes Attapulgite-150 clay content of dry blend, in wt %; and R is the mix ratio, kg/m^3. The equation may be used to estimate 28-d compressive strengths of grouts prepared within the compositional range of this investigation.

29410 **(PNL—5745) Design of a mixing system for simulated high-level nuclear waste melter feed slurries.** Peterson, M.E.; McCarthy, D.; Muhlstein, K.D. (Pacific Northwest Labs., Richland, WA (USA)). Mar 1986. Contract AC06-76RL01830. 125p. NTIS, PC A06/MF A01; GPO Dep. File Number DE86009039.

The Nuclear Waste Treatment Program development program consists of coordinated nonradioactive and radioactive testing combined with numerical modeling of the process to provide a complete basis for design and operation of a vitrification facility. The radioactive demonstration tests of equipment and processes are conducted before incorporation in radioactive pilot-scale melter systems for final demonstration. The mixing system evaluation described in this report was conducted as part of the nonradioactive testing. The format of this report follows the sequence in which the design of a large-scale mixing system is determined. The initial program activity was concerned with gaining an understanding of the theoretical foundation of non-Newtonian mixing systems. Section 3 of this report describes the classical rheological models that are used to describe non-Newtonian mixing systems. Since the results obtained here are only valid for the slurries utilized, Section 4, Preparation of Simulated Hanford and West Valley Slurries, describes how the slurries were prepared. The laboratory-scale viscometric and physical property information is summarized in Section 5, Laboratory Rheological Evaluations. The bench-scale mixing evaluations conducted to define the effects of the independent variables described above on the degree of mixing achieved with each slurry are described in Section 6. Bench-scale results are scaled-up to establish engineering design requirements for the full-scale mixing system in Section 7. 24 refs., 37 figs., 44 tabs.

29411 **(PNL-SA—13396) Operating radioactive liquid-fed ceramic melter system.** Bjorklund, W.J.; McElroy, J.L. (Pacific Northwest Labs., Richland, WA (USA)). Feb 1986. Contract AC06-76RL01830. 6p. (CONF-860317—45). NTIS, PC A02/MF A01; GPO Dep. File Number DE86010220.

From Waste management '86; Tucson, AZ, USA (2 Mar 1986).

Under sponsorship of the Department of Energy's Nuclear Waste Treatment Program (NWTP), a high-level radioactive waste vitrification system has been installed in the Radiochemical Engineering Facility at Hanford, Washington. The pilot-scale radioactive vitrification system consists of a melter, canister-handling turntable, glass-level detection system, and supporting waste preparation, off-gas treatment and condensate treatment systems. During the past year, radioactive shakedown testing of all the systems has occurred, preparing it for production-type operation campaigns in 1986. This paper discusses the results of the radioactive shakedown completed in 1985.

29412 **(PNL-SA—13733) Treatment strategies for transuranic wastes.** Schneider, K.J.; Swanson, J.L.; Ross, W.A.; Allen, R.P.; Yasutake, K.M. (Pacific Northwest Labs., Richland, WA (USA)). Jan 1986. Contract AC06-76RL01830. 8p. (CONF-860317—46). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010221.

From Waste management '86; Tucson, AZ, USA (2 Mar 1986).

This paper presents an analysis of treatment options or strategies for transuranic wastes expected to be generated at a commercial nuclear fuel reprocessing plant. Six potential options were analyzed, ranging from no treatment to maximum volume reduction and high quality waste forms. Economics for the total management of these (treatment, transportation, disposal) indicate life-cycle savings for extensive treatment are as high as $1.7 billion for 70,000 MTU. Evaluations of the waste processing and waste forms support the selection of a number of the extensive waste treatments. It is concluded that there are significant incentives for extensive treatment of transuranic wastes.

29413 **(RFP—3871) Waste Systems progress report, March 1984-February 1985.** Hickle, G.L. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 11 Apr 1986. Contract AC04-76DP03533. 38p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009786.

The high-volume usage of nitric acid at defense facilities engaged in nuclear material reprocessing and/or actinide recovery results in the generation of large amounts of nitrate waste. Methods were identified that could destroy or convert the nitrate compounds to a waste form more acceptable for final disposal. A Salt Disposal process is being implemented to oxidize calcium metal contained in the Direct Oxide Reduction waste salt. This process is required to comply with Waste Isolation Pilot Plant, Waste Acceptance Criteria. Methods for immobilizing the particulate in HEPA filters are being developed to ensure compliance with Waste Isolation Pilot Plant, Waste Acceptance Criteria. A handbook, compiling techniques for reducing the generation of transuranic waste at major TRU waste sites, was published. Investigation was performed to determine the compatibility of the output of the Ferrite Waste Treatment process with existing or planned waste immobilization processes.

29414 **(RHO-BW-SA—344-P) Structure and evolution of the Horse Heaven Hills in South-Central Washington.** Hagood, M.C. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Mar 1986. Contract AC06-77RL01030. 215p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE86009864.

The purpose of this study is to describe the structure and evolution of the Horse Heaven Hills uplift at its abrupt structural transition. This was achieved by: (1) delineating the structure within the two trends as they approach the intersection; (2) determining the timing and location of uplift within each trend; (3) comparing and contrasting Miocene vertical growth rates along folds within both trends; and (4) imposing constraints for tectonic models that pertain to the genesis of the Horse Heaven Hills uplift. These objectives can only be fulfilled if the stratigraphy of the area is first delineated. Data from this study suggest that tectonic models that directly or indirectly pertain to the origin of the Horse Heaven Hills uplift may be constrained by: (1) the predominance of monoclinal or near-monoclinal fold geometries and reverse faults along both the northwest and northeast trends; (2) preliminary data which suggest clockwise rotation has occurred along folds of both trends; (3) folds along both trends developing simultaneously and at similar rates (at least during Wanapum and Saddle Mountains time); (4) folds along the northwest trend of the Horse Heaven Hills uplift being genetically related to and forming simultaneously with at least certain folds along the Rattlesnake-Wallula structural alignment; (5) the uplift developing simultaneously with the north-northwest-trending Hog Ranch-Naneum Ridge anticline as well as other Yakima folds during at least Columbia River Basalt Group time. It is proposed that folds of both trends of the Horse Heaven Hills uplift were generated by the same tectonic processes.

29415 **(RHO-BW-ST—73-P) State of in situ stresses determined by hydraulic fracturing at the Hanford Site.** Kim, K.; Dischler, S.A.; Aggson, J.R.; Hardy, M.P. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Feb 1986. Contract AC06-77RL01030. 186p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86009902.

This report summarizes the hydraulic fracturing stress determinations conducted during the period 1981 through 1983 by the Basalt Waste Isolation Project. These tests were conducted in boreholes DC-12, RRL-2, RRL-6, and DC-4 to estimate the state of stress in and about the candidate repository horizons within the Hanford Site. Three of these boreholes (RRL-2, RRL-6, and DC-4) are within the reference repository location. Test procedures, test data, analysis methodology, and calculated in situ stresses in the Cohassett, Grande Ronde 7, Umtanum, and McCoy Canyon basalt flows are presented, along with a brief discussion of seismic activity in the Pasco Basin, core disking, and borehole spalling observed in Hanford Site boreholes.

29416 **(RHO-RE-PL—34-P) Preliminary Hanford Waste Vitrification Plant waste form qualification plan.** Nelson, J.L. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Feb 1986. Contract AC06-77RL01030. 41p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009208.

The objective of this plan is to identify the basic steps, activities, interactions, milestones, proposed schedule, and cost estimates needed to ensure that the Hanford Waste Vitrification Plant (HWVP) defense high-level and transuranic (TRU) waste glass product will be acceptable for disposal in the candidate geologic repositories. 6 refs., 4 figs., 6 tabs.

29417 **(SAND—83-1982C) Operational procedures for receiving, packaging, emplacing, and retrieving high-level and transuranic waste in a geologic repository in tuff.** Dennis, A.W.; Mulkin, R.; Frostenson, J.C. (Sandia National Labs., Albuquerque, NM (USA); Los Alamos Technical Associates, Inc., NM (USA)). 1984. Contract AC04-76DP00789. 5p. (CONF-840307—53). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009468.

From Waste management '84; Tucson, AZ, USA (11 Mar 1984).

The Nevada Nuclear Waste Storage Investigations Project, directed by the Nevada Operations Office of the Department of Energy, is currently developing conceptual designs for a commercial nuclear waste repository. In this paper, the preliminary repository operating plans are identified and the proposed repository waste inventory is discussed. The receipt rates for truck and rail car shipments of waste are determined, as are the required repository waste emplacement rates. 3 refs., 7 figs., 4 tabs.

29418 **(UCID—20673) Spent Fuel Test-Climax mineby revisited.** Butkovich, T.R. (Lawrence Livermore National Lab., CA (USA)). Dec 1985. Contract W-7405-ENG-48. 34p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008103.

As part of the Spent Fuel Test-Climax an experiment known as the mineby was conducted to measure the displacements and stress changes from mining a central drift between two parallel drifts. Extensometers and stress gauges were emplaced from the side drifts into the pillars to be formed upon mining of the center drift. The results showed a general stress decrease and apparent narrowing of the pillar. This is in contrast with a number of calculations of this process that were made by a number of different investigators. Since all the calculations show a broadening of the pillar during the mineby, a hypothesis to explain this apparent discrepancy was tested. This hypothesis is that the explosives used to break the rock in the mining of the central drift, in the process of expanding, caused the gauges to move away from the wall, giving the measurement which made it appear that the pillar got narrower. Although the results from the demonstration of the hypothesis is not definitive, it does show that explosives can have a significant effect on the measurements, and raises a red flag with respect to future use of this type of instrumentation for measuring effects of mining on the rock mass. 18 refs., 14 figs., 3 tabs.

29419 **Public Law 99-240: an act to amend the low-Level Radioactive Waste Policy Amendments Act of 1985. Introduced in the Senate and House of Representatives of the United States of America in Congress assembled, Ninety-Ninth Congress, January 15, 1986.** Washington, DC; Government Printing Office (1986). vp.

Public Law 99-240 changes and improves the procedures for establishing regional facilities for low-level radioactive wastes to make it easier or states to form compact commissions. The Act gives each state the responsibility for providing, either by itself or in cooperation with one or more other states, for the disposal of wastes generated within the state except for those generated at DOE or military facilities. The Act describes the formation of such compacts and their relations to federal laws affecting transport and safety regulations. It also makes provisions for a transition period during which certain facilities will have limited availability. The Act outlines provisions for the management of regional commissions, penalties for non-compliance, financial arrangements, and other regulations.

29420 **Scientific basis for nuclear waste management IX.** Werme, L.O. (ed.). Pittsburgh, PA; Materials Research Society (1986). 817p. (CONF-850995—). Publications Department, Materials Research Society, 9800 McKnight Rd., Suite 327, Pittsburgh, PA 15237. File Number TI86009648.

From Materials Research Society international symposium; Stockholm, Sweden (9 Sep 1985).

The proceedings consist of 93 papers presented at the symposium. The papers have been arranged into eleven sections, including an overview section of invited papers. The sections of submitted papers are: fluids in crystalline rock; waste form performance - glass; waste form performance - ceramics and spent fuel; canisters - design, materials and performance, near-field chemistry; thermal and stress effects on fluids in rocks and diffusion and transport in clay buffers; transport in fractured rocks; radionuclide speciation and sorption; solute and colloid transport; geotechnical and transport modelling. Individual papers were processed for inclusion in the Energy Data Base. (PLG)

29421 **Data processing in the integrated data base for spent fuel and radioactive waste.** Forsberg, C.W.; Morrison, G.W.; Notz, K.J. (Oak Ridge National Laboratory, Oak Ridge, TN). pp 533-536 of Waste isolation in the U.S., technical programs and public education. Vol. 2. La Grange Park, IL; American Nuclear Society (1984). (CONF-840307—).

From Waste management '84; Tucson, AZ, USA (11 Mar 1984).

The Integrated Data Base (IDB) Program at Oak Ridge National Laboratory (ORNL) produces for the U.S. Department of Energy (DOE) the official spent fuel and radioactive waste inventories and projections for the United States through the year 2020. Inventory data are collected and checked for consistency, projection data are calculated based on specified assumptions, and both are converted to a standard format. Spent fuel and waste radionclides are decayed as a function of time. The resulting information constitutes the core data files called the Past/Present/Future (P/P/F) data base. A data file management system, SAS /sup R/, is used to retrieve the data and create several types of output: an annual report, an electronic summary data file designed for IBM-PC /sup R/ -compatible computers, and special-request reports.

29422 **Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste.** Toste, A.P.; Kirby, L.J.; Pahl, T.R. (Geosciences Research and Engineering Department, Pacific Northwest Laboratory, Richland, WA). pp 557-564 of Waste isolation in the U.S., technical programs and public education. Vol. 2. La Grange Park, IL; American Nuclear Society (1984). (CONF-840307—).

From Waste management '84; Tucson, AZ, USA (11 Mar 1984).

The subsurface migration of radionuclides has been studied at a commercial, shallow-land burial site of low-level nuclear waste at Maxey Flats, Kentucky. A variety of radionuclides including ^{3}H, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{60}Co, ^{137}Cs and ^{90}Sr have migrated short dis-

tances on-site (meters to tens of meters). A number of the mobile radionuclides, notably plutonium and ^{60}Co, appear to exist as anionic species with organic properties. As a result, we have studied the organic geochemistry of radioactive leachates pumped from a number of waste burial trenches throughout the site. The major aim of the organic research is to elucidate the role of organic compounds in mediating the subsurface migration of the mobile radionuclides in groundwater. A survey study of hydrophilic and hydrophobic organic content of the waste leachates has revealed that organic compounds are readily leached from the buried waste. Organic chelating agents like EDTA, HEDTA and ED3A are the major hydrophilic organic compounds in the leachates, their concentrations ranging from 78 ppb to 19,511 ppb. A number of carboxylic acids are also present in the leachates, ranging from 671 ppb to 8,757 ppb, collectively. A variety of hydrophobic organic compounds including barbiturates and other aromatic compounds, presumably waste-derived, are also present in the leachates, generally at lower ppb concentrations. A detaile chemical speciation study, aimed at determining whether any of the organic compounds identified in the survey study are associated with the mobile radionuclides, was undertaken using leachate from one of the waste trenches. It is clear that EDTA is chelated to plutonium and ^{60}Co in the leachate, potentially mobilizing these radionuclides. Other radionuclides, ^{137}Cs and ^{90}Sr, may be associated with polar organic compounds such as carboxylic acids.

29423 **Simulation of the MRS receiving and handling facility.** Triplett, M.B.; Hostick, C.J.; Imhoff, C.H. (Pacific Northwest Laboratory, Richland, WA). pp 447-452 of Waste isolation in the U.S., technical programs and public education. Vol. 2. La Grange Park, IL; American Nuclear Society (1984). (CONF-840307—).

From Waste management '84; Tucson, AZ, USA (11 Mar 1984).

Monitored retrievable storage (MRS) will be required to handle a large volume of spent fuel or high-level waste (HLW) in case of delays in repository deployment. The quantities of materials to be received and repackaged for storage far exceed existing waste management facilities capability to handle them. A computer simulation model of the MRS receiving and handling (R & H) facility has been constructed and used to evaluate design alternatives. Studies have identified processes or activities that may constrain throughput performance. The model also has helped to assess design tradeoffs such as those to be made among improved process times, redundant service lines, and improved component availability.

29424 **Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid.** Hurst, F.J.; Crouse, D.J. (Oak Ridge National Lab., TN). *Hydrometallurgy;* **13**: 15-32(1984). Contract W-7405-ENG-26.

As of mid-1983, over 1000 tons of U_3O_8 per year is being recovered in the USA from wet-process phosphoric acid using the DEPA-TOPO process developed at Oak Ridge National Laboratory. Another 3000 tons of U_3O_8 per year passes through a number of small phosphate plants unrecovered, because the economics of the process are considered to be marginal at current market conditions. This paper describes equilibrium measurements, studies of uranium reduction kinetics, and uranium(IV) extraction which show how the efficiency of the reductive strip step, a key process operation, can be significantly increased by the use of high concentrations of H_3PO_4 in the aqueous strip solution. This procedure greatly improves the reduction kinetics allowing decreased retention time in the mixers, use of lower Fe(II) concentration, and smaller process equipment. A model of mixer-settler unit describes the system over a 5-10 molar H_3PO_4 range. 9 references, 11 figures, 3 tables.

29425 **Leach resistance of iodine compounds in Portland cement.** Scheele, R.D.; Burger, L.L.; Wiemers, K.D. (Pacific Northwest Lab., Richland, WA). *ACS Symposium Series;* No. 246, 373-387(1984).

Studies have shown that there is a considerable difference in stability and leach resistance among the various iodine compounds in Portland III cement. Of the compounds examined, AgI had the best leach resistance followed by AgZI, $Ba(IO_3)_2$, $Ca(IO_3)_2$, $Hg(IO_3)_2$, and $Sr(IO_3)_2$. Long time extrapolations of leach rates are uncertain to one or two orders of magnitude, but the data indicate that if the disposal form comes in continuous contact with the water the ^{129}I will be released before it has decayed. Thus, good disposal strategy includes a mechanism for dispersal such that dilution to harmless levels is achieved. For interim storage, where a dry environment can be assured, and for transportation, the forms appear to be adequate.

29426 **Chemical and physical consequences of α and β^- decay in the solid state.** Young, J.P.; Haire, R.G.; Peterson, J.R.; Ensor, D.D. (Oak Ridge National Lab., TN). *ACS Symposium Series;* No. 246, 335-346(1984). Contract W-7405-ENG-26;AS05-76ER04447.

Interesting chemical and structural phenomena can occur when radioactive materials are stored in the solid state. Extensive studies have been made of both the chemical and physical status of progeny species that result from the α or β^- day of actinide ions in several different compounds. The samples have been both initially pure actinide compounds - halides, oxides, etc. and actinides incorporated into other non-radioactive host materials, for example lanthanide halides. In general, the oxidation state of the actinide progeny is controlled by the oxidation state of its parent (a result of heredity). The structure of the progeny compound seems to be controlled by its host (a result of environment). These conclusions are drawn from solid state absorption spectral studies, and where possible, from x-ray diffraction studies of multi-microgram sized samples. 13 references, 4 figures, 4 tables.

29427 **Development of sphene-based glass-ceramics for disposal of some Canadian wastes.** Speranzini, R.A.; Hayward, P.J. (Chalk River Nuclear Labs., Ontario). *Advances in Ceramics;* **8**: 273-281(1984).

Intermediate-level alkaline waste from an experimental thorium fuel reprocessing facility was partitioned into actinide contaminated and nonactinide contaminated fractions by using sodium titanate. The $^{233}U/^{235}U$-contaminated titanate was converted into a glass-ceramic, on the basis of the natural mineral sphene, by the addition of glass-making chemicals followed by heat treatment. A novel process was developed to simplify the treatment of such liquid wastes. Stainless steel or Inconel cartridges are prepared to contain suitable mixtures of sodium titanate, mordenite, and bone char, all of which possess good ion-exchange capacity, together with an insoluble source of Ca and Si, such as wollastonite. After use in decontamination of the waste stream, the cartridges and their contents are heat treated in a tube furnace to produce durable sphene-based glass ceramics. Processing of wastes is easier and volumes of products are smaller compared with rival immobilization methods. 17 references, 1 figure, 3 tables.

29428 **Scientific basis for Nuclear Waste Management VIII.** Jantzen, C.M.; Stone, J.A.; Ewing, R.C. (eds.). Pittsburgh, PA; Materials Research Society (1984). 978p. (CONF-841157—). Materials Research Society, 9800 McKnight Rd., Suite 327, Pittsburgh, PA 15237 . File Number TI85015352.

From Materials Research Society annual meeting; Boston, MA, USA (26 Nov 1984).

Papers were presented at the following sessions: Leaching Mechanisms; Materials Performance in Repositing Environments; Spent Fuel Studies; Geochemical Interactions; Natural Analogues; Radiation Effects; Research at the US Department of Energy Materials Characterization Center; Processing Technology; Materials Science of Concrete in Waste Management; and Low-Level Waste Studies. Industrial papers were indexed separately.

29429 **Leach testing of waste glasses under near-saturation conditions.** Grambow, B.; Strachan, D.M. (Hahn-Meitner Institut fuer Kernforschung Berlin GmbH, West Germany). *Materials Research Society Symposia Proceedings;* **26**: 623-634(1984).

Two waste glasses, MCC 76-68 and C31-3, were leached in deionized water and 0.001 M $MgCl_2$ for periods up to 158 days. At 57 days the gel layer was removed from some of the specimens and leaching continued for up to 100 days. Results from leaching in

deionized water showed that the gel layer was not protective. Results from leaching in 0.001 M $MgCl_2$ are in good agreement with the predicted results obtained from the use of the PHREEQE geochemical code and with sepiolite [$Mg_2Si_3O_8(OH)_4$] as the Mg-bearing precipitate. Both B and Si were predicted and observed to increase with increasing glass dissolution while maintaining sepiolite solubility. Both MCC 76-68 and C31-3 glasses showed increased leaching in 0.001 M $MgCl_2$ upon removal of the layer. This suggests that the leaching mechanisms is a function of the difference in the silica chemical potential between the glass and the gel layer. 14 references, 7 figures, 2 tables.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 29314, 29340, 29420, 29422, 30579, 30582, 30583, 30584, 30617

29430 **(AECL—8364) Soil nuclide distribution coefficients and their statistical distributions.** Sheppard, M.T.; Beals, D.I.; Thibault, D.H.; O'Connor, P. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Dec 1984. 73p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85900455.

Work performed under Canada/US Waste Management Information Exchange Agreement.

Environmental assessments of the disposal of nuclear fuel waste in plutonic rock formations require analysis of the migration of nuclides from the disposal vault to the biosphere. Analyses of nuclide migration via groundwater through the disposal vault, the buffer and backfill, the plutonic rock, and the consolidated and unconsolidated overburden use models requiring distribution coefficients (K/sub d/) to describe the interaction of the nuclides with the geological and man-made materials. This report presents element-specific soil distribution coefficients and their statistical distributions, based on a detailed survey of the literature. Radioactive elements considered were actinium, americium, bismuth, calcium, carbon, cerium, cesium, iodine, lead, molybdenum, neptunium, nickel, niobium, palladium, plutonium, polonium, protactinium, radium, samarium, selenium, silver, strontium, technetium, terbium, thorium, tin, uranium and zirconium. Stable elements considered were antimony, boron, cadmium, tellurium and zinc. Where sufficient data were available, distribution coefficients and their distributions are given for sand, silt, clay and organic soils. Our values are recommended for use in assessments for the Canadian Nuclear Fuel Waste Management Program. 91 refs., 33 tabs.

29431 **(AECL—8371) Hydrothermal flow-through apparatus to simulate leaching of nuclear waste forms under quasi-dynamic conditions.** Heimann, R.B. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Mar 1985. 45p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85901265.

Work performed under Canada/US Waste Management Information Exchange Agreement.

A hydrothermal flow-through apparatus has been designed that will allow the testing of individual waste package components, as well as combinations of these, under a wide range of environmental conditions. The maximum permissible temperature is 700°C, while the maximum pressure is 300 MPa. Flow rates can be adjusted by sequential operation of a pneumatically operated valve with preset pause and working cycles. The main applications of the apparatus to nuclear fuel waste management research are: the study of migration of ionic species through a rock column at specified hydraulic head; and the study of the rate of leaching of radionuclides from waste forms under disposal vault conditions in the presence of groundwater with variable flow rates. 21 figs., 2 tabs.

29432 (CONF-850314—Vol.2, pp 113-115) **Field sampling design and method of statistical analysis to define the areal extent of PCB contamination in low-level waste pond sediments.** Prohammer, L.A.; Riley, R.G.; Thomas, J.M. (Pacific Northwest Lab., Richland, WA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

This study demonstrates a cost-effective, site-specific field sampling program and statistical analysis scheme to estimate the areal extent of organic chemical contamination in low-level chemical and radioactive waste pond sediments. This approach was used to estimate the distribution of polychlorinated biphenyls (PCB's) in a Hanford area low-level waste pond. Using the statistical technique of kriging, a contour map of PCB concentrations in the pond was developed. The kriging analysis produced variance estimates about the contours, allowing evaluation of the estimated PCB concentrations and the ability to optimize placement of further sampling effort. Results of the study indicated that PCB concentrations in the pond sediments were generally less than 100 ppB.

29433 (CONF-850314—Vol.2, pp 257-261) **Release of organic reagents from solidified decontamination wastes.** Piciulo, P.L.; Adams, J.W. (Brookhaven National Lab., Upton, NY). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC02-76CH00016.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

In order to provide technical information needed by the US Nuclear Regulatory Commission to evaluate the adequacy of near-surface disposal of decontamination wastes, Brookhaven National Laboratory has measured the release of organic reagents from solidified simulated decontamination wastes. The waste streams consisted of either mixed-bed ion-exchange resins or anion exchange resins equilibrated with EDTA, oxalic acid, citric acid, picolinic acid or simulated LOMI decontamination reagent. These simulated resin wastes were solidified in either cement or vinyl ester-styrene. Samples were tested by a fixed interval leach procedure or according to the standard ANS 16.1 procedure. The leachability indices, which were calculated as prescribed in ANS 16.1, varied with leach period for some of the composites tested.

29434 (CONF-850314—Vol.2, pp 319-323) **Waste management practices to control biological transport of radioactivity at the Hanford Site.** Conklin, A.W. (Rockwell Hanford Operations, Richland, WA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

One of the goals of waste management in the Hanford Site 200 Areas is to prevent biological intrusion into, and transport from, waste storage and disposal sites. Practices established to achieve these goals include the elimination of deep-rooted vegetation on waste sites to prevent plant root intrusion into radioactivity, selective herbicide application to prevent regrowth of these plants, planting of shallow-rooted plants to successfully compete with deep-rooted plants for moisture, surface stabilization, and environmental surveillance. Past biological transport incidents have included transport by Russian thistle by way of physiological plant processes, bird access into exposed contamination, and animals burrowing into radioactive waste disposal sites. Rockwell Hanford Operations, through mitigative actions and continued surveillance, has made significant progress in eliminating, or better isolating source terms, thus preventing or inhibiting problems from recurring. Approximately 60% of source term acreage requiring stabilization or decontamination has been completed.

29435 (CONF-850314—Vol.2, pp 325-328) **Remedial waste management practices resulting in the decline of airborne plutonium adjacent to a liquid waste disposal ditch at the Hanford site.** Elder, R.E. (Rockwell Hanford Operations, Richland, WA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Ambient air sampling at the 216-Z-19 Ditch identified the need for interim stabilization (a waste management procedure that includes covering with soil and revegetation) of the site. The 216-Z-19 Ditch, a low-level liquid waste disposal ditch in the Hanford Site 200 West Area, received multigram quantities of /sup 239, 240/Pu during its 10-year service history (1971 to 1981). Since 1977 there has been an ambient air sampler stationed near the head end of the ditch. This station consistently measured elevated levels of /sup 239, 240/Pu (ranging from a concentration of 0.003 to 0.044 picocurie per cubic meter (pCi/m^3) with an average of 0.015 pCi/m^3). Resuspension of the plutonium in the ditch soil was deter-

mined to be the source of these elevated levels. Through the use of temporary, site-specific air sampling stations near the ditch, it was determined that these levels were limited to the head end of the ditch. Following interim stabilization of the ditch, the levels of /sup 239, 240/Pu in air declined to less than 1% of their former levels and are now at Hanford background levels (0.00008 pCi/m³).

29436 **(DP-MS—85-138) Transport of nitrate from a large cement based waste form.** Pepper, D.W. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1986. Contract AC09-76SR00001. 10p. (CONF-860681—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008045.

From 6. international conference on finite elements in water; Lisbon, Portugal (1 Jun 1986).

A finite-element model is used to calculate the time-dependent transport of nitrate from a cement-based (saltstone) monolith with and without a clay cap. Model predictions agree well with data from two lysimeter field experiments begun in 1984. The clay cap effectively reduces the flux of nitrate from the monolith. Predictions for a landfill monolith design show a peak concentration occurring within 25 years; however, the drinking water guideline is exceeded for 1200 years. Alternate designs and various restrictive liners are being considered.

29437 (MLM—3332, pp 5-10) **Surface tritium contamination studies.** Sienkiewicz, C.J. 28 Jan 1986. NTIS, PC A03/MF A01. File Number DE86007083.

In Tritium control, October 1984-September 1985.

Glovebox wipe surveys were conducted to correlate surface tritium contamination with atmospheric tritium levels. Surface contamination was examined as a function of tritium concentration and limited to the HT/T_2 form. The previously predicted relationship between atmospheric HTO concentration and cleanup times was examined in order to predict a model for atmospheric detritiation of stainless steel enclosures. 2 figures, 2 tables.

29438 (MLM—3332, pp 10-11) **Gas generation measurements on tritiated waste materials.** Tadlock, W.E. 28 Jan 1986. NTIS, PC A03/MF A01. File Number DE86007083.

In Tritium control, October 1984-September 1985.

Gas generation rates caused by radiolysis of tritiated waste materials were determined for polymer and nonpolymer impregnated tritiated concrete and fixated and nonfixated tritiated waste vacuum pump oil. In addition, the pressure change of hydrogen cover gas over tritiated waste on cement-plaster was determined.

29439 (MLM—3332, pp 12-15) **Emergency containment system.** Kent, L.R. 28 Jan 1986. NTIS, PC A03/MF A01. File Number DE86007083.

In Tritium control, October 1984-September 1985.

The Emergency Containment System (ECS) was tested with tritium to determine the overall capture efficiency of the system. Results from the first test indicate that the ECS captured over 99% of the tritium processed by the system. Room ventilation problems, however, contributed to a significant fraction of the initial release being stacked instead of being sent to the ECS for processing. Additional testing will be done after the ventilation problems are corrected.

29440 **(NP—6901179) Design review of the SYVAC Executive, November 1984-February 1985.** Lane, G.D. (Scicon Ltd., London (UK)). Feb 1985. 76p. Scicon Ltd., 49 Berners St., London W1P 4AQ. File Number TI86901179.

The report documents the current SYVAC Executive design. Eight criteria for evaluating aspects of the design as objectively as possible are described as well as the results of applying them. Principle benefits arising from implementation of design recommendations are perceived to be improved maintainability and better delineation of the interface between the Executive and SYVAC submodels.

29441 **(NUREG/CR—4520) Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments.** Peterson, S.R.; Martin, W.J.; Serne, R.J. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 144p. (PNL—5788). NTIS, PC A07/MF A01 - GPO. File Number TI86010248.

A computer-based conceptual chemical model was applied to predict contaminant concentrations in plumes migrating from a uranium mill tailings waste impoundment. The solids chosen for inclusion in the conceptual model were selected based on reviews of the literature, on ion speciation/solubility calculations performed on the column effluent solutions and on mineralogical characterization of the contacted and uncontacted sediments. The mechanism of adsorption included in the conceptual chemical model was chosen based on results from semiselective extraction experiments and from mineralogical characterization procedures performed on the sediments. This conceptual chemical model was further developed and partially validated in laboratory experiments where assorted acidic uranium mill tailings solutions percolated through various sediments. This document contains the results of a partial field and laboratory validation (i.e., test of coherence) of this chemical model. Macro constituents (e.g., Ca, SO_4, Al, Fe, and Mn) of the tailings solution were predicted closely by considering their concentrations to be controlled by the precipitation/dissolution of solid phases. Trace elements, however, were generally predicted to be undersaturated with respect to plausible solid phase controls. The concentration of several of the trace elements were closely predicted by considering their concentrations to be controlled by adsorption onto the amorphous iron oxyhydroxides that precipitated.

0540 Health And Safety

REFER ALSO TO CITATION(S) 29302, 29305, 29378, 29440

29442 (CONF-850314—Vol.2, pp 277-279) **Revised worker exposure estimates for TMI-2 radioactive waste processing and decontamination.** Snyder, B.J. (US Nuclear Regulatory Commission, Washington, DC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

As progress in the cleanup from the accident at TMI-2 has been made, more information has become available to improve estimates of worker exposure. Recently revised estimates by the US Nuclear Regulatory Commission have been made which are higher by about a factor of 6 over estimates made in early 1981 prior to any manned entries into the reactor building. 5 refs., 1 fig., 2 tabs.

29443 (CONF-850314—Vol.2, pp 309-318) **Radiological analysis for dry cask storage of spent fuels.** Oh, I.; Sells, J.E.; Silverberg, T.C. (Stone and Webster Engineering Corp., Denver, CO; Northern States Power Co., Minneapolis, MN). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A study to evaluate the radiological implementation requirements for dry cask storage of spent fuel at the Monticello and Prairie Island plant sites has been conducted by Stone and Webster Engineering Corporation at the request of Northern States Power Company (NSP). Based on the simulation of the spent fuel loading and cask transfer operations, the dose calculations including accident and operational exposures were performed, and the anticipated manpower requirements, occupancy times, and assumptions for handling operations of spent fuel dry casks were evaluated. 3 refs., 4 figs., 4 tabs.

29444 (CONF-850314—Vol.2, pp 345-349) **Calculation of dose rates from critical radionuclides in low-level radioactive waste disposal.** Sutherland, A.A.; Merrell, G.B.; Rogers, V.C.; Grant, M.W. (Rogers and Associates Engineering Corp., Salt Lake City, UT). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Dose rates to persons using a well near a low-level radioactive waste disposal site for drinking and irrigation are calculated. Major contributors to those dose rates are shown to be tritium, carbon-14, and iodine-129. Suggestions for reducing potentially high dose rates from tritium and carbon-14 are provided. However, the volume of the waste containing iodine-129 and the long life of that isotope make the methods used for tritium and carbon-14 either technically impractical or costly. Suggestions are made for further research into the assumptions underlying the predictions of serious dose rates from iodine-129.

29445 **(CONF-860695—1) Hazardous Waste Remedial Actions Program: integrating waste management.** Petty, J.L.; Sharples, F.E. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010046.

From HazMat '86: hazardous materials management conference and exhibition; Atlantic City, NJ, USA (2 Jun 1986).

The Hazardous Waste Remedial Actions Program was established to integrate Defense Programs' activities in hazardous and mixed waste management. The Program currently provides centralized planning and technical support to the Office of the Assistant Secretary for Defense Programs. More direct project management responsibilities may be assumed in the future. The Program, under the direction of the ASDP's Office of Defense Waste and Transportation Management, interacts with numerous organizational entities of the Department. The Oak Ridge Operations Office has been designated as the Lead Field Office. The Program's four current components cover remedial action project identification and prioritization; technology adaptation; an informative system; and a strategy study for long-term, "corporate" project and facility planning.

29446 **(NUREG/CR—2675-Vol.5) Relevance of biotic pathways to the long-term regulation of nuclear waste disposal. Estimation of radiation dose to man resulting from biotic transport: the BIOPORT/MAXI1 software package. Volume 5.** McKenzie, D.H.; Cadwell, L.L.; Gano, K.A.; Kennedy, W.E. Jr.; Napier, B.A.; Peloquin, R.A.; Prohammer, L.A.; Simmons, M.A. (Pacific Northwest Labs., Richland, WA (USA)). Oct 1985. Contract AC06-76RL01830. 331p. (PNL—4241-Vol.5). NTIS, PC E12/MF A01 - GPO. File Number TI86010247.

Includes 6 sheets of 24x reduction microfiche.

BIOPORT/MAXI1 is a collection of five computer codes designed to estimate the potential magnitude of the radiation dose to man resulting from biotic transport processes. Dose to man is calculated for ingestion of agricultural crops grown in contaminated soil, inhalation of resuspended radionuclides, and direct exposure to penetrating radiation resulting from the radionuclide concentrations established in the available soil surface by the biotic transport model. This document is designed as both an instructional and reference document for the BIOPORT/MAXI1 computer software package and has been written for two major audiences. The first audience includes persons concerned with the mathematical models of biological transport of commercial low-level radioactive wastes and the computer algorithms used to implement those models. The second audience includes persons concerned with exercising the computer program and exposure scenarios to obtain results for specific applications. The report contains sections describing the mathematical models, user operation of the computer programs, and program structure. Input and output for five sample problems are included. In addition, listings of the computer programs, data libraries, and dose conversion factors are provided in appendices.

29447 (NUREG/CR—4214, pp II.1-II.87) **Early occurring and continuing effects.** Scott, B.R.; Hahn, F.F. (Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM). Jul 1985. NTIS, PC A16/MF A01 - GPO. File Number TI85017968. (SAND—85-7185).

In Health effects model for nuclear power plant accident consequence analysis. Part 1. Introduction, integration, and summary. Part II. Scientific basis for health effects models.

This chapter deals with health-risk estimates for early and continuing effects of exposure to ionizing radiations that could be associated with light water nuclear power plants accidents. Early and continuing effects considered are nonneoplastic diseases and symptoms that normally occur soon after radiation exposure, but may also occur after years have passed. They are generally associated with relatively high (greater than 1 Gy) doses. For most of the effects considered, there is a practical dose threshold. Organs of primary interest, because of their high sensitivity or the likelihood of receiving a large radiation dose, are bone marrow, gastrointestinal tract, thyroid glands, lungs, skin, gonads, and eyes. In utero exposure of the fetus is also considered. New data and modeling techniques available since publication of the Reactor Safety Study (WASH 1400, 1975) were used along with data cited in the Study to develop improved health-risk models for morbidity and mortality. The new models are applicable to a broader range of accident scenarios, provide a more detailed treatment of dose protraction effects, and include morbidity effects not considered in the Reactor Safety Study. 115 references, 20 figures, 19 tables.

29448 (NUREG/CR—4214, pp II.89-II.138) **Late somatic effects.** Gilbert, E. (Battelle Pacific Northwest Labs., Richland, WA). Jul 1985. NTIS, PC A16/MF A01 - GPO. File Number TI85017968. (SAND—85-7185). Contract AC04-76DP00789.

In Health effects model for nuclear power plant accident consequence analysis. Part 1. Introduction, integration, and summary. Part II. Scientific basis for health effects models.

A model is provided for estimating risks of late effects resulting from low-LET radiation exposure likely to be received in the event of a nuclear power plant accident. Separate estimates are provided for risks of leukemia, cancers of the bones, lungs, gastrointestinal tract, thyroid, skin, and the residual group of all other cancers; estimates of leukemia and other cancers due to in utero exposure are also provided. Risks are expressed in absolute terms as the number of cancer deaths (or cases) per million persons exposed to a particular dose. In addition, the number of years of life lost and the number of years of life lived after the occurrence of cancer are also estimated. The model used in the earlier Reactor Safety Study has been modified to reflect additional epidemiological data and these changes are described in detail. 37 references, 1 figure, 13 tables.

29449 (NUREG/CR—4214, pp II.139-II.180) **Genetic effects.** Abrahamson, S.; Bender, M.; Denniston, C.; Schull, W. (Univ. of Wisconsin, Madison). Jul 1985. NTIS, PC A16/MF A01 - GPO. File Number TI85017968. (SAND—85-7185).

In Health effects model for nuclear power plant accident consequence analysis. Part 1. Introduction, integration, and summary. Part II. Scientific basis for health effects models.

Modeling analyses are used to predict the outcomes for two nuclear power plant accident scenarios, the first in which the population received a chronic dose of 0.1 Gy (10 rad) over a 50 year period, the second in which an equivalent population receives acute dose of 2 Gy. In both cases the analyses are projected over a period of five generations. The risk analysis takes on two major forms: the increase in genetic disease that would be observed in the immediate offspring of the exposed population, and the subsequent transmission of the newly induced mutations through future generations. The classes of genetic diseases studied are: dominant gene mutation, X-linked gene mutation, chromosome disorders and multifactorial disorders which involve the interaction of many mutant genes and environmental factors. 28 references, 3 figures, 5 tables.

29450 **(PNL—5841) Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual.** Hawley, K.A.; Peloquin, R.A.; Stenner, R.D. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 142p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE86009731.

This document describes both the original Hazard Ranking System and the modified Hazard Ranking System as they are to be used in evaluating the relative potential for uncontrolled hazardous substance facilities to cause human health or safety problems or ecological or environmental damage. Detailed instructions for using the mHRS/HRS computer code are provided, along with instructions for performing the calculations by hand. Uniform application of the ranking system will permit the DOE to identify those re-

leases of hazardous substances that pose the greatest hazard to humans or the environment. However, the mHRS/HRS by itself cannot establish priorities for the allocation of funds for remedial action. The mHRS/HRS is a means for applying uniform technical judgment regarding the potential hazards presented by a facility relative to other facilities. It does not address the feasibility, desirability, or degree of cleanup required. Neither does it deal with the readiness or ability of a state to carry out such remedial action, as may be indicated, or to meet other conditions prescribed in CERCLA. 13 refs., 13 figs., 27 tabs.

0550 Regulations

REFER ALSO TO CITATION(S) 30759

29451 **(AEEW-R—1925) Review of NRTMA statistical tests.** Russell, N.S. (UKAEA Atomic Energy Establishment, Winfrith. Control and Instrumentation Div.). Oct 1984. 107p. (SRDP-R—114). Atomic Energy Establishment, Winfrith Dorchester, Dorset, England. File Number TI86901177.

The purpose of International Safeguards in the industry is to detect, and thereby deter, the diversion of nuclear materials from civil to military purposes. For the larger bulk handling nuclear facilities, it is proposed that conventional materials accountancy techniques, which are part of the detection process, should be enhanced by the use of near-real-time materials accountancy. This technique makes use of the streams of data acquired for plant control purposes. Several statistical techniques have been developed, which can be used to analyse the data streams, in order to detect accountancy anomalies. This report describes the more promising tests and examines their performance capabilities for detection purposes.

29452 **(BNL—37685) Load-cell-based weighing system for weighing 9.1 and 12.7-tonne UF_6 cylinders.** McAuley, W.A.; Kane, W.R. (Oak Ridge Gaseous Diffusion Plant, TN (USA); Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016;AC05-84OR21400. 6p. (CONF-860654—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007133.

From 27. annual meeting of the Institute of Nuclear Materials Management; New Orleans, LA, USA (22 Jun 1986).

For the independent verification of UF_6 cylinder masses by the International Atomic Energy Agency (IAEA) at uranium enrichment facilities, an 18-tonne capacity Load-Cell-Based Weighing System (LCBWS) has been developed. The system was developed at Brookhaven National Laboratory and the Oak Ridge Gaseous Diffusion Plant and calibrated at the US National Bureau of Standards. The principal components of the LCBWS are two load cells, with readout and ancillary equipment, and a lifting fixture that couples the load cells to a cylinder. Initial experience with the system demonstrates that it has the advantages of transportability, ease of application, stability, and an attainable accuracy of 2 kg or better for a fully cylinder.

29453 **(K/OA—6004) International Atomic Energy Agency UF_6 cascade header pipe test loop: safety assessment.** Fields, L.W. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Apr 1986. Contract AC05-84OT21400. 26p. (ISPO—257). NTIS, PC A03/MF A01; GPO Dep. File Number DE86009735.

Radiological, health physics, safety, and criticality considerations for the second generation UF_6 cascade header pipe test loop are discussed, and design criteria, materials of construction, instrumentation, and electical requirements are noted. Patterned after the Oak Ridge demonstration test loop that was used for uranium deposition experiments and measurement technology demonstrations, the second generation test loop is being designed and fabricated at the Oak Ridge Gaseous Diffusion Plant for use by the International Atomic Energy Agency (IAEA) at their Safeguards Analytical Laboratory in Seibersdorf, Austria, under sponsorship of the US Program of Technical Assistance to IAEA Safeguards, Task A-136, "UF_6 Cascade Header Pipe Test Loop." By simulating operating flows, pressures, and pipe deposits characteristic of gas centrifuge enrichment plant piping, the test loop will enable the IAEA (1) to evaluate and to calibrate instrumentation designed to verify the enrichment of UF_6 gas under various flowing and static operating conditions in plant piping and (2) to train inspectors in the use of such instrumentation. Studies show that, if all prescribed UF_6 handling and test loop operational procedures and precautions are adhered to, no health physics problems or incremental safety hazards are posed with normal test loop operation.

29454 **(SAND—86-0009) Improving security communications at fixed-site facilities.** Snell, M.K.; Gangel, D.J.; Heustess, J.E. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1986. Contract AC04-76DP00789. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009557.

Developing a high degree of network resistance to jamming, deception, and eavesdropping is difficult but not impossible. Spread-spectrum radios are becoming commercially available which could be used to provide a high level of resistance in certain applications. However, there are several other techniques that can be utilized at relatively low cost and operational impact to the facility. Procedures and hardware can be designed so as to minimize dependence on the radio. To the extent that the radio net must be used, it can be made as resistant as possible by use of better equipment, procedures, and training. Response exercises under simulated jamming and deception attacks are very important in designing countermeasures and maintaining proficiency in these measures. 3 refs., 2 figs.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

REFER ALSO TO CITATION(S) 31012

0702 Radiation Sources

29455 **(CEA-CONF—8148) Food irradiation: a technology for the eighties.** Laizier, J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Sep 1985. 35p. (CONF-8509242—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751352.

From Seminar on food irradiation; Seoul, Korea (16 Sep 1985).

After a brief review of the physical principles of the process of food irradiation and the biological and chemical effects of radiations, data concerning studies about the wholesomeness of irradiated food are presented. The most important fields of potential industrial applications are described. The technology of food irradiators, the economy, present status and future trends of food irradiation are analyzed, with emphasis on the French example.

0703 Isotopic Power Supplies

29456 (N—86-17839, pp vp) **Interplanetary exploration-A challenge for photovoltaics.** Stella, P.M. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Future U.S. interplanetary missions will be less complex and costly than past missions such as Voyager and the soon to be launched, Galileo. This is required to achieve a balanced exploration program that can be sustained within the context of a limited budget. Radioisotope thermoelectric generators (RTGs) have served as the power source for missions beyond the orbit of Mars. It is indicated that the cost of these power sources will significantly increase. Solar arrays can provide a low cost alternative for a number of missions. Potential missions are identified along with concerns for implementation, and some array configurations under present investigation are reviewed.

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 30218, 30225, 30289, 30291

29457 **Long-term endurance and selection studies in hydrogen and oxygen photoproduction by Chlamydomonas reinhardtii.** Reeves, M.; Greenbaum, E. (Oak Ridge National Lab., TN). *Enzyme and Microbial Technology;* 7: 169-174(Apr 1985).

Two wild-type strains of Chlamydomonas reinhardtii have been subjected to repeated cycles of anaerobiosis, carbon dioxide deprivation, and irradiation as a means of testing the long-term stability of hydrogen and oxygen photoproduction and the effectiveness of these conditions as selection or adaptation pressures for increasing hydrogen and/or oxygen yields. Simultaneous hydrogen and oxygen photoproduction yields were monitored in each culture for 160 h. The cells were then removed from the reaction chamber and used to inoculate fresh growth medium to produce the culture for the next experiment. This cycle was repeated five times. Yields of hydrogen and oxygen improved after three cycles and declined in the fourth and fifth; unlike the second and third cycles, extended periods of aerobic growth were used for the fourth and fifth cycles. The stability of hydrogen and oxygen photoproduction was greater in the fifth cycle than in any of the previous cycles. These subpopulations had hydrogen and oxygen production rates, at 160 h, which were nearly equal to the rates at the beginning of the fifth-cycle experiments. Time profiles of the relative hydrogen yields from each of the five cycles, prepared at 32, 80, and 120 h, show that the relative yield in each varies with the point in time at which the profile was taken. Chlorophyll retention increased with each successive cycle, indicating selection or adaptation for a more durable population of cells with respect to the light-harvesting component of the photosynthetic apparatus. 21 references, 5 figures, 1 table.

29458 **Photovoltaic-electrolyzer system performance results.** Piraino, M.; Metz, D.D. (Brookhaven National Lab., Bldg. 475, Upton, NY 11973). pp 451 of Proceedings of Intersol 85. Ottawa, Ontario; SESCI (1985). (CONF-850604—).

From INTERSOL '85 - Solar energy--the diverse solution; Montreal, Canada (23 Jun 1985).

Brookhaven National Laboratory (BNL), as part of the U.S. Department of Energy Chemical/Hydrogen Energy Systems (C/HES) Program, is developing a Hydrogen Technology Evaluation Center, a facility built to test and analyze more efficient and less expensive methods of producing, storing, transporting, and using hydrogen as an energy source. The purpose of the Center is to: Evaluate advanced hydrogen energy systems; Promote hydrogen technology transfer to the commercial sector; Provide a hands-on learning tool for hydrogen energy systems; Promote cooperative R & D with the public and private sectors; Foster international cooperation in hydrogen technology within the framework of the International Energy Agency (IEA). To accomplish these goals, the Center has been designated a User's Facility, which makes it available to outside users from industry, universities, and other government laboratories. Arrangements are made on an individual basis. Initially, the Center is being used to investigate the production of hydrogen from solar energy via water electrolysis--the first of a series of system evaluations--via a coordinated program of system testing, computer simulation, and economic analysis. A PV-electrolyzer system, based on a 5-kW Solarex PV array and a 15-kW General Electric Solid Polymer Electrolyte (SPE) Electrolyzer, is in place and undergoing evaluation. In operation, the PV array is augmented by a 300% "boost" from a computer-controlled power supply.

0802 Storage

REFER ALSO TO CITATION(S) 30216

29459 **(BNL—37866) Advanced hydrogen storage: modified vanadium hydrides. Final report.** Libowitz, G.G. (Allied Corp., Morristown, NJ (USA). Corporate Technology). Aug 1985. Contract AC02-76CH00016. 33p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86009916.

Body centered solid solution alloys of general composition V-Ti-M (where M = Fe, Mn, Cr, Al) were investigated for use as hydrogen storage materials. Phase relations and thermodynamic properties of the V-Ti-M-H systems were determined. It was found that the enthalpies and entropies of hydride formation were significantly higher (absolute values) than those of most intermetallic compounds. Because of their thermodynamic properties it was concluded that these alloy hydrides are not particularly suitable for hydrogen storage, but that the thermodynamic properties are most favorable for their use as hydrogen compressors or in hydride heat pumps.

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 30251

29460 **(ANL/CNSV-TM—174) Bioconversion: a new technology for waste and sludge disposal. Workshop proceedings.** Brooks, C. (comp.). (Argonne National Lab., IL (USA)). Feb 1986. Contract W-31-109-ENG-38. 117p. (CONF-850539—). NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86009668.

From RefCom: a briefing for industry (RefCom is an experimental facility for anaerobic digestion of sludge and municipal waste); Ft. Lauderdale, FL, USA (22 May 1985).

Anaerobic digestion of biomass offers a solution to the disposal of sewage sludge, municipal wastes, and other organic materials (agricultural and industrial residue, as well as terrestrial and marine energy crops) and produces a methane-rich gas. These proceedings are the result of a bioconversion workshop that was held to introduce the technology that results in bioconversion of these wastes to gas. The technology is based on bacterial decomposition of organic material into simpler compounds. The principal products of this process are methane and carbon dioxide. The workshop agenda included discussions of the anaerobic technology and presentations of operating data and economic forecasts developed at RefCoM (refuse conversion to methane), an experimental plant operating in Pompano Beach, Florida.

29461 **(CONF-8405400—) Biogas workshop on community plants. Report.** (Bremer Arbeitsgemeinschaft fuer Ueberseeforschung und Entwicklung (Germany, F.R.)). 1984. 503p. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Resulting from an exchange and comparison of experiences, the workshop firmly stated that success will not be achieved if governments do not provide a political, organizational and economic framework, thus making biogas technology a tool in development processes. Biogas, in particular community biogas plants, can be integrated into and improve the existing infrastructure, e.g. sanitation programmes, slum improvement, and public facilities. 23 papers were separately treated. (orig./EF).

29462 (CONF-8405400—, pp 209-264) **Biogas supply for the fictitious village of Kama in India. Case study.** Sasse, L. (Bremer Arbeitsgemeinschaft fuer Ueberseeforschung und Entwicklung, Germany, F.R.). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The present imaginary village of Kama is based on a typical Indian village. The assumptions made are realistic, however, freely invented. The figures determined should of course under no circumstances be regarded as absolute. The study is an attempt to show the relative importance of the parameters involved in considering a community plant. To sum up, we may conclude that the advantages of community plants are to be found less in their economy, but rather in the framework of development policy and ecology. (orig.).

29463 (CONF-8405400—, pp 265-318) **Variants of biogas supply for the fictitious village of 'Rima', South East Asia, (threshold country). Case study.** Stephan, B.; Dingeldein, H. (Bremer Arbeitsgemeinschaft fuer Ueberseeforschung und Entwicklung, Germany, F.R.; Hochschule Bremerhaven, Germany, F.R.; Hochschule Bremerhaven, Germany, F.R.). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The determination of a community biogas plant concept (integrated supply and sanitation concept) as shown below is comply, according to the frame data, with the demands of hygiene and odourlessness and to supply - as compensation for the financial efforts made for construction and maintenance of the plant - for instance, energy for possibly existing enterprises, for preparation of hot water, fuels for the stoves and organic fertilizer. Three supply and sanitation variants have been conceived and evaluated for the settlement. These are adequate for connection of 155 production units. Variant A consists of biogas plants to be operated jointly by up to 20 connected households. Gas utilization is effected in a decentralized manner in the individual households by combustion (cooking, preparation of hot water). Variant B shows the same digesters as variant A, however, converts the biogas, next to the digesters, in small motor generator sets into electric power, subsequently distributed to the various households. Variant C shows a central large size biogas plant with only one generator. The electric power produced is being distributed to the various households. Cost/profit analysis of the variants shows as a result that construction and operation according to variant A prove to be the most appropriate solution. The profits thereby to be achieved annually per family are adequate to secure the financial requirements of construction and operation of the system as well as to enable investments into extension measures. (orig./EF).

29464 (CONF-8405400—, pp 321-332) **Biogas technology for water pumping in Botswana.** Khatibu, M. 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The purpose of the project was to prove that under field conditions biogas systems offers significant advantages in terms of economics and user acceptability compared to the conventional diesel system. The life of the population will be influenced in many ways by the introduction of biogas technology. The economic advantages due to a reduction of fuel foreign exchange costs and increased crop yields by better fertilization lead to a complex improvement of living conditions in the rural areas. Even for young people working as farmers biogas technology remains attractive. (orig./EF).

29465 (CONF-8405400—, pp 333-342) **Potential and development of biogas technology in Burundi: Options and constraints.** Niyimbona, P.; Baratakanwa, V. 1984. (In French). NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

In view of the rural structure of Burundi, more interest is taken in household biogas systems than in community biogas systems. About 15 systems are constructed every year, supported by the Government (financial aid, foreign assistance projects, training, etc.). The future prospects of biogas technology are considered to be satisfactory. (orig.).

29466 (CONF-8405400—, pp 343-352) **Multiple utilization of the biomass.** Huang Zhijie. 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The Chinese Government has included the development of biogas in the Rural Development Programme as an indispensible part of her effort to modernize her agriculture. Although some achievements have been made and experience obtained in China's biogas development, there are still many defects and problems in the work. Efforts are being made to improve the work. It is expected that the use of biogas in China will register bigger progress in the coming decade. (orig./EF).

29467 (CONF-8405400—, pp 353-357) **Primary approach to the engineering of centralized biogas supply system in Shanghai outskirts.** Jin Yao. (Shanghai Municipal Biogas Office, China). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

This article will give a brief introduction on the engineering of centralized biogas supply systems scale, work and gas supply circumstances in Shanghai outskirts and provide some general analysis and approaches to the development of the engineering. At present, there are mainly two types of biogasconstructions: household biogas digesters and centralized biogas supply system. The household biogas digesters are mainly built in the areas where people live separately and the raw materials are not be easy to be concentrated. The centralized biogas supply system is usually constructed in the places where people live together and raw materials are abundant. These two types of biogas systems have respectively shown their superiorities and got very good benefit in the practice. This article will give a brief introduction on the centralized biogas supply system and provide some basic analysis and approaches to the development of this system. (orig./EF).

29468 (CONF-8405400—, pp 358-361) **Attempt of the biogas development and utilization. The introduction of the community biogas digesters and biogas distribution to each family in an agricultural research institute.** Lai Yaofu. (Sichuan Provincial Biogas Office, Chengdu, China). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The Mian Yang Agriculture Research Institute is located in the suburb of Mian Yang City, Sichuan Province, China. It is a comprehensive institute that puts the stress on breeding and cultivation. The animal population of the Institute consists of a dairy of 62 cows, 6 heads of farm cattle and 50 pigs. Since 1979, 97 families of 140 members have been using biogas as a source of living fuel by making use of the human and animal wastes and crop stalks as raw materials for biogas fermentation, generating biogas from the community biogas digesters, managing the digesters in an unified way, supplying biogas at fixed time and regulating gas distribution to the families' supply of gas. This not only saved some coal for the state, but also reduced a lot of housework for the workers and staff of the Institute and provided some good-quality organic fertilizer for agricultural production. Biogas development and utilization accelerated developing the agriculture scientific research of the Institute. (orig./EF).

29469 (CONF-8405400—, pp 362-375) **Anaerobic digestion of slaughter waste water.** Qian Zeshu; Feng Xiaoshan; Yu Xiue; Wang Zhiren; Shen Yongxun. 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Slaughter waste water from the Hangzhou Meat Processing Complex has been put into test for nearly one year to produce biogas under natural temperature with an anaerobic filter having a total capacity of 48 m^3 (24 m^3x2). 9,719 m^3 wastewater of 1580 mg COD/1. average strength was treated and 10.91 tonnes COD of organic matter was removed, producing 1,828 m^3 biogas. The averaged values of various technical indices measured during the test

run were: hydraulic loading 0.9 $m^3/m^3.d$, concentration of discharged water 414 mg.COD/l.; COD removal 71%; organic matter removal per unit volume filter 1.0 kg.COD/m^3.d; per unit volume biogas production rate 0.21 $m^3/m^3.d$; methane content in biogas 85%; pH value of discharged water 5.6-7.1. From the condition of the test appropriate height of the filter was determined as 6 m (ratio between the internal diameter and the clear height being 1:3.5-1:4.0). Taking this geometric shape and counting 48 m^3 volume, the technical efficacy indexes of the filter may reach: hydraulic loading 1.5 $m^3/m^3.d$; COD removal 68%; organic matter removal rate 1.6 kg.COD/m^3.d; set volume of the facility 625 m^3/tonne COD removed day, gas production rate 0.33 $m^3/m^3.d$. (orig.).

29470 (CONF-8405400—, pp 376-386) **Pilot experiment for cooperative community biogas facilities in rural Egypt indicated social failure.** El Halwagi, M.M.; Hamad, M.A.; Abdel Dayem, A.M. (National Research Centre, Cairo, Egypt). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Economies of biogas plants tend to favour community-scale systems. Cultural factors relevant to the target social groups, however, appear to constitute a critical condition for the viability of such systems. Cooperation among beneficiaries may not always be secured to the desired extent. An alternative would be to operate the biogas plant as an independent venture. This calls for establishing a special management scheme with inevitable increasing costs in a system which is already characterized by hazy economies. Within the context of the National Research Centre (NRC) biogas technology demonstration programme in rural areas of Egypt, community plants were considered in the original plants. The prevelant possessive and individualistic nature of the Egyptian villager, made the direct implementation of community biogas units quite a risky endeavour. To assess the feasibility of such an undertaking, a limited pilot experiment was conducted. A shared biogas unit was established for two neighbouring and highly amicable families in a new-planned Egyptian village. Though all conditions were intentionally selected to favour the success of this limited-sharing facility, social differences ultimately rendered the unit inoperable. Though the back history of the two families had never indicated a single serious incidence of dispute, the close ties between the two families have been almost completely severed as a consequence of the joint biogas facility. (orig.).

29471 (CONF-8405400—, pp 387-396) **Development of biogas technology in Ethiopia.** Abraha, S. (Ministry of Energy and Mines, Addis Abeba, Ethiopia). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

This paper describes an attempt made to introduce New and Renewable Sources of Energy with particular emphasis on the dissemination and popularization of biogas in rural Ethiopia. (orig.).

29472 (CONF-8405400—, pp 397-404) **Community biogas programmes of Gram Vikas.** Madiath, J. (Gram Vikas, Berhampur, India). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Gram Vikas, is involved in the promotion of family size biogas plants throughout the state of Orissa. In the year 1983, Gram Vikas constructed 213 family biogas plants. It is expected to complete another 600 nos. of plants in 1984. The heart of Gram Vikas, however, is in promoting community biogas plants. They may be a greater challenge, but the satisfaction is more as the social distribution of the amenity is more just, where the haves and have-nots get equality of benefits. (orig./EF).

29473 (CONF-8405400—, pp 405-413) **Some thoughts on the Community Biogas Plants.** Patel, J.J. 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

In India a CBP (Community Biogas Plant) is and should always be accompanied with public latrines, as an additional service. All refuse, animal dung, field waste, leaves of trees, cattle dung, urine, excreta and water weeds should be recycled in the CBP system. All this may be achieved in stages, but the aim must be to fully cover these targets. Finally the CBP should be run as a commercial concern. CBP considered necessary because it became evident that all families could not be served with small family level biogas plants. It should also be recognised that recycling all village wastes is as important as supply of fuel gas. The target must be to recoup as many plant nutrients as possible from wastes. Most of all, soils which receive regular application of biofertilizers have shown steady improvement in their basic capacity to produce more crops year after year. The biogas plants produce more and better organic fertilizer from organic wastes, than direct composting. (orig./EF).

29474 (CONF-8405400—, pp 434-440) **Socio-economic impacts of community biogas plants in Nepal.** Devkota, G.P. (Gobar Gas Tatha Krishi Jantra Vikash, P Ltd., Butwal, Nepal. Research Unit). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

A community biogas plant is defined as a group of people who share in part ownership of a biogas plant installation. For the success of community biogas plant there should be a great need of community biogas plant, the people in the community should be very cooperative and it should be an income generating projects. Failures lie with the implementors but not the community or the technology itself. So the programmes should be implemented only according to our planning. The responsibility in the operation and maintenance of the system should also be shared by its owners. If a larger sized and community biogas plant can be owned and if the gas used more commercially and for agricultural purposes, the socio-economic impacts of community biogas plant will be more attractive. (orig.).

29475 (CONF-8405400—, pp 451-455) **Implementation of biogas strategy in livestock disciplines in Thailand.** (Chiangmai Univ., Thailand. Dept. of Animal Husbandry). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Biogas utilization in Thailand is increasing, mainly for cooking purposes. Most of the biogas plants are found among well family households. The fixed dome type plant is in most cases less expensive than that of the floating dome type. Expansion of the biogas plants is encouraged successfully by subsidiary scheme provided by the National Energy Administration, which supported about 3000 biogas plants between 1980-1983. Pig farm settlements are areas which adopt the biogas through cooperation with the private sectors. Dairy farms have access to raw material for the biogas plants but need encouragement by effective subsidy. (orig.).

29476 (CONF-8405400—, pp 456-460) **Promotion of biogas in rural Thailand by the Population and Community Development Association (PDA).** Sornjitti, P.; Hayssen, J. (Population and Community Development Association, PDA, Bangkok, Thailand). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Environmental conditions in Thailand as well as the infrastructure are conducive for the development of biogas. Temperatures are favorable for biogas, cattle and pig waste are available, construction materials are easy to obtain and water is available year-round in most areas (except for the Northeast, Thailand's poorest region). The National Energy Administration provides a subsidy of 30% on the costs of construction materials for a dome type digestor. (orig./EF).

29477 (CONF-8405400—, pp 461-464) **Possibilities and limits of community biogas plants in the frame work of biogas propagation strategy in Viet Nam.** Thurong, N. (State Commission for Science and Technology, Hanoi, Viet Nam). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

In Vietnam, the development of the family biogas plants with digester made of bricks and floating gas holder of ferrocement or steel have been growing. This kind of energy supply for family use suits the Vietnam rural conditions. Because of the simplicity of feed stock supply, each family may accumulate dung and all their agricultural wastes for his own plant, the care given by any family to its own biogas plant is the best, the family does not need to pay the plant service and maintenance, and can use slurry as fertilizer for its own needs. In each cattle station and pigsty, there are about 100 cows or buffaloes, or 300 - 500 pigs. The energy produced by the biogas plant is used for cooking of food and running of water pumps. (orig./EF).

29478 (CONF-8405400—, pp 465-469) **Sealing biogas plants with flexible plastic covers. Experiences gained with a German digester.** Zimmermann, C.; Hohlfeld, J. (UTEC G.m.b.H., Goehrde, Germany, F.R.). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

It has always been a big problem to build gastight digesters. Especially the Chinese fixed-dome biogas plants and digesters made out of concrete are creating many problems. There are different solutions to minimize gas leaks: using steel or plastic gas domes, avoiding brick- or concrete-made gas chambers by increasing the slurry level in the digester (e.g. the Borda-design), attaching a sealing directly into the walls and the ceiling. This sealing may consist of mortar, paraffine as well as synthetic materials based on tar, plastic or glassfibre. (orig./EF).

29479 (CONF-8405400—, pp 470-474) **Experiences with a low temperature biogas plant.** Kopiske, G.; Eggersgluess, H. (UTEC G.m.b.H., Goehrde, Germany, F.R.). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Experiences of the first year's operation of a low temperature biogas plant are described. After one year the growth phase is still not finished, an optimal digestion process seems to be reached not before a few years of operation. Intensive initial inoculation can reduce this phase. In spite of inefficient agitation, up to 185 l/kg VS were produced. After exchanging the agitation system this was rising further up to 208 l/kg VS lately. Laboratory tests and experiences with other biogas plants indicate that gas yields can be expected beeing comparable to those in mesophile systems. The authors take low temperature systems as a good possibility to broaden the scope of biogas technique widely. Individual planning is compulsary to realize an economical solution. (orig.).

29480 (CONF-8405400—, pp 475-479) **Electrical control of a cogeneration set in parallel mains operation or in stand-by operation.** Ahlers, R. (Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig, Germany, F.R. Inst. fuer Technologie). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The use of gas produced is decisive for the efficiency of a biogas plant. One possible use which has been investigated is the production of electric energy while at the same time using the heat. The control technique which is necessary for producing electric, energy parallel to the mains and in stand-by operation is designed on a gas engine/electro-synchronous generator set, which is installed in the biogas test-plant of the FAL. The plant conception and the switch set-up of the generator is described. The process of mains intrusion with the individual states of operation is dealt with, as is the method of operation in stand-by. (orig.).

29481 (CONF-8405400—, pp 480-487) **Experiences on handling liquid substrates of high solid content in agricultural biogas-plants.** Baader, W.; Kloss, R. (Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig, Germany, F.R. Inst. fuer Technologie). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

Mixtures of homogenous organic slurry and coarse vegetable matter are characterized by the tendency to separate owing to flotation and by the risk of accumulating of coarse, preferable fibrous matter, causing an uncontrolled flow through the total system followed by a blockage. To overcome these fluid mechanical problems in practice preferably the horizontal canal-type digester with mechanical stirring device and the multiple chamber-type digester with hydraulic stirring by gas-displacement are used. As a newly developed solution to achieve in the digester the controlled flow of mixture which tend to separate, a completely filled up-flow loop-digester is described. (orig.).

29482 (CONF-8405400—, pp 488-494) **FAL-biogas R/D project.** 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

In January 1979 at the Institute for Technology of the FAL the research and development project 'Performance of the anaerobic process for producing biogas and fertilizer' was started. It is essentially directed towards problems of process engineering. By determining the methane production in relation to the fermentation time for materials of different composition and for different combinations of materials evidence about their suitability as substrate can be obtained. For this research an installation was built which enables 48 batch fermentation tests in 5 1 containers to be carried out simultaneously. To be able to get utilisation oriented evidence from the project an experimental installation was set up which because of its dimensions and equipment is able to reflect the actual working conditions to be expected in practical operation. In June 1980 a trial operation was started with this installation. Using cattle slurry gas yields similar to those of an installation of conventional design in good order were obtained. (orig./EF).

29483 (CONF-8405400—, pp 495-500) **Model as an instrument for determining the optimal layout of biogas plants with regard to technical and economical aspects.** Kloss, R. (Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig, Germany, F.R. Inst. fuer Technologie). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The aim of this work is to find out the best layout possible for a biogas plant under special consideration of technical and economical aspects. As method to answer this question a model has been created. In order to see the importance of the more than forty in this model implemented parameters they have been variated under practical conditions. The result of this investigation was that parameters as aim of the process, degree and method of gas utilization, related gross energy yield of the substrate fed, retention time, digester insulation, substrate temperature before feeding and the structure of the investment costs have a great influence on the economy of biogas plants. The consequence is, that under the individual conditions of farms in the FRG, a certain chance can be seen, if the plant is optimated, which makes the use of biogas technology promising. (orig.).

29484 **(EUR—8906) Critical evaluation of anaerobic fermentation of waste products 'a management study'.** Anderton, M.F.; Gibbs, D.F. (Commission of the European Communities, Luxembourg). 1984. 170p. NTIS (US Sales Only), PC A08/MF A01. File Number DE86751872.

This report is an Executive Summary of the results of a study of the technology of anaerobic fermentation, applied to waste products in relation to energy saving (primary energy needs) within the Community. Specific interests in individual Community countries and factors which may affect the implementation of anaerobic

fermentation techniques have been considered. The technology reviews shows that the efficiency of biogas production has advanced little over the last 3 to 5 years. Most current research is aimed at improving this performance either from a better understanding of the microbiological/biochemical processes involved or by improvements in plant design. From estimates of available wastes, it is concluded that the maximum possible energy contribution that anaerobic digestion could make is no more than 3% of the Community's primary energy demand. However, in practical terms transport, preprocessing storage, etc.) the net benefits will be marginal. Overall the real value of anaerobic digestion lies with its environmental applications.

29485 **(GB—9) Anaerobic digestion and biocatalysis.** (Department of Energy, Washington, DC (USA); Department of Energy, London (UK)). Sep 1985. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86009887.

A report is given on the scope of the technical programmes in the UK and the US on anaerobic digestion and biocatalysis. The study arises from the Collaboration Agreement signed by the respective Secretaries of State for Energy in the UK and US in 1984. The present state-of-the-art in both countries is described for biocatalysis of wastes of various types and anaerobic digestion for landfill gas, bioreactors, sewage sludge, industrial effluents and farm wastes and crops. The two areas identified for joint UK/US collaboration in this field are landfill gas and biocatalysis. (UK).

29486 **(PNL—5801) Biomass thermochemical conversion program. 1985 annual report.** Schiefelbein, G.F.; Stevens, D.J.; Gerber, M.A. (Pacific Northwest Labs., Richland, WA (USA)). Jan 1986. Contract AC06-76RL01830. 76p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE86010259.

Wood and crop residues constitute a vast majority of the biomass feedstocks available for conversion, and thermochemical processes are well suited for conversion of these materials. The US Department of Energy (DOE) is sponsoring research on this conversion technology for renewable energy through its Biomass Thermochemical Conversion Program. The Program is part of DOE's Biofuels and Municipal Waste Technology Division, Office of Renewable Technologies. This report briefly describes the Thermochemical Conversion Program structure and summarizes the activities and major accomplishments during fiscal year 1985. 32 figs., 4 tabs.

29487 **Non-aceticlastic methanogenesis from acetate: acetate oxidation by a thermophilic syntrophic coculture.** Zinder, S.H.; Koch, M. (Cornell Univ., Ithaca, NY). *Archives of Microbiology;* **138**: 263-272(1984). Contract AC02-81ER10872.

Methanogenesis from acetate by a rod-shaped enrichment culture grown at 60°C was found to require the presence of two organisms rather than a single aceticlastic methanogen. A thermophilic Methanobacterium which grew on H_2/CO_2 or formate was isolated from the enrichment. Lawns of this methanogen were used to co-isolate an acetate oxidizer in roll tubes containing acetate agar. The rod-shaped acetate oxidizer was morphologically distinct from the methanogen and did not show F_{420} autofluorescence. The coculture completely degraded 40 μmol/ml acetate, and produced nearly equal quantities of methane, and methanogenesis was coupled with growth. The doubling time for the coculture at 60°C was 30-40 h and the yield was 2.7 +/- .0.3 g dry wt/mol CH_4. Studies with ^{14}C-labelled substrates showed that the methyl group and the carboxyl group of acetate were both converted primarily to CO_2 by the coculture and that CO_2 was concurrently reduced to CH_4. During growth, there was significant isotopic exchange between CO_2 and acetate, especially with the carboxyl position of acetate. These results support a mechanism for methanogenesis from acetate by the coculture in which acetate was oxidized to CO_2 and H_2 by one organism, while H_2 was subsequently used by a second organism to reduce CO_2 to CH_4. Since the H_2 partial pressure must be maintained below 10^{-4} atm by the methanogen for acetate oxidation to be thermodynamically feasible, this is an example of obligate interspecies hydrogen transfer. This mechanism was originally proposed for a single organism by Barker in 1936. 55 references, 5 figures, 3 tables.

29488 **Chemical kinetics of propane oxidation in gaseous detonations.** Westbrook, C.K.; Pitz, W.J.; Urtiew, P.A. (Lawrence Livermore National Lab., CA). *Progress in Astronautics and Aeronautics;* **94**: 151-174(1984). Contract W-7405-ENG-48.

From 9. ICODERS; Poitiers, France (3-8 Jul 1983).

A theoretical model including a detailed chemical kinetic reaction mechanism for hydrocarbon oxidation is used to examine detonation properties for mixtures of propane-air, propane-oxygen, and propane-oxygen diluted with varying amounts of nitrogen. Computed induction lengths are compared with available experimental data for critical energy and critical tube diameter for initiation of unconfined spherical detonation, as well as detonation limits in linear tubes. 43 references, 6 figures, 1 table.

29489 **Chemical kinetics of hydrocarbon oxidation in gaseous detonations.** Westbrook, C.K. (Lawrence Livermore National Lab., CA). *Combustion and Flame;* **46**: 191-210(1982). Contract W-7405-ENG-48.

A theoretical model including a detailed chemical kinetic reaction mechanism for hydrocarbon oxidation is used to examine detonation properties for mixtures of fuel-air, fuel-oxygen diluted with varying amounts of nitrogen. Fuels considered are methane, ethane, acetylene, and methanol. Computed induction lengths are compared with available experimental data for critical tube diameter for initiation of detonation, as well as detonation limits in planar, cylindrical, and spherical configurations. 44 references, 10 figures, 2 tables.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 29489, 30046

0903 Inorganic Hydrogen Compound Fuels

REFER ALSO TO CITATION(S) 30208, 30209

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 30027

29490 **(VTT-TIED—513) Wood fuels properties and principles of pricing.** Laine, R.; Sahrman, K. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Oct 1985. 71p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751672.

The basic unit in the structure of wood is the cell which consists of a wall and a cellhole. The main components in the wall structure are cellulose, hemicellulose, lignin, extractives and ash. The content of nitrogen in wood is below 0.5% and the content of sulphur about 0.01%. The water content of fresh wood is 40-60%. The Finnish tree species have saturated humidity at 28%. This has importance in drying and shrinking of wood. Heat value, moisture content and size of pieces are the most important factors of wood as fuel. Moisture content, tree species, part of the tree, timber assortment and pile density or chip density have influence on the effective heat value of mass or volume unit. Moisture makes heat value lower. Wrong moisture makes the effect ratio of the boiler lower and makes even combustion extra troublesome. The small size of wood fuel pieces has usually positive effects and the size distribution should be even. In principle, pricing of wood fuels could be based on heat value of the volume unit, on moisture content and on the effect ratio of the boiler. Pricing could be performed with aid of price coefficient curves as a function of the moisture content. There is need of research and development in laboratory-screening of wood fuels, in measuring of quantity, density and amount of heat and in the principles of pricing.

29491 **(VTT-TUTK—379) Utilization of chipwood in Lapland. Prehandling.** Laine, R.; Okkonen, J. (Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)). Oct 1985. 78p. (In Finnish). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751671.

This research studied the handling of smallwood in Lapland starting from chipping and the use of produced chips for different purposes. The costs of different harvesting methods were also studied. The drum screening test of fuel chips on production scale gave signs that the oversized fraction of chips may with this technique be removed. The quantity of the oversized fraction was about 10% and of the undersized fraction about 40%, with the screening drum with holes of 80x80 mm with oversized and of o 40 mm with undersized used in the tests. There were no large pieces or spreading particles in the accepted fraction with the mentioned quantity of oversized fraction. Comparing partwood and wholewood harvesting methods with traditional shortwood logging systems the quantity of wood material grows significantly. Felling costs go down, but forest haulage costs go up as do long distance haulage costs, too. A prehandling station of chips with a capacity of 100,000 loose m^3/a could consit of a receiving station, a conveyor to the chip storage, an unloading screw of storage, a conveyor to screens, discscreens and conveyors of pulp and fuel fraction and storages.

13 HYDRO ENERGY

REFER ALSO TO CITATION(S) 29944

1303 Plant Design And Operation

29492 Microhydropower development in the United States: a demonstration project. Suagee, D.B. (Eastern Band of Cherokee Indians, P.O. Box 455, Cherokee, North Carolina 28719). pp 551 of Proceedings of Intersol 1985. Ottawa, Ontario; SESCI (1985). (CONF-850604—).

From INTERSOL '85 - Solar energy--the diverse solution; Montreal, Canada (23 Jun 1985).

There are more than 1,400 potential microhydroelectric sites in the mountains of western North Carolina with a combined potential average generating capacity of more than 24,500 kilowatts. While this is a small amount of generating capacity from the perspective of utility planners, most of these sites could provide for most or all of the power needs of one or more homes, farmsteads, or a small community or new light industry. Because of this potential for improving social and economic conditions of the southern Appalachian Region, The Energy Division of the North Carolina Department of Commerce (with funding from the U.S. Department of Energy), The Appropriate Technology Program of Appalachian State University, and the eastern band of Cherokee Indians have undertaken a project to develop a typical site as a demonstration. Funding and assistance provided by the U.S. Bureau of Indian Affairs and Save the Children Federation have also helped to make this demonstration project possible. There are two primary objectives of this demonstration project. The first is to help the interested public learn about microhydro technology by having a properly designed demonstration project in operation and open to the public. The second is to help other developers in obtaining the necessary regulatory clearances by proceeding with careful attention to regulatory requirements and by producing documents that can be made available to other developers for their use as samples.

1306 Environmental Aspects

REFER ALSO TO CITATION(S) 30590, 30685

29493 (DOE/BP/20733—1) Monitoring of downstream salmon and steelhead at federal hydroelectric facilities. Annual report 1985. Johnsen, R.C.; Ranck, C.L. (National Marine Fisheries Service, Portland, OR (USA). Environmental and Technical Services Div.). Nov 1985. Contract AI79-85BP20733. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86008824.

Juvenile salmonids were monitored on their seaward migration at Lower Granite, McNary, and John Day Dams: sampling at these sites provided data primarily for evaluation of smolt survival, travel time, and migrational timing. At Lower Monumental Dam catch data was to provide a general indication of smolt passage and comparison with the hydroacoustics passage index.

29494 (DOE/BP/39644—1) Smolt passage behavior and flow-net relationship in the forebay of John Day Dam. Final report 1985. Giorgi, A.E.; Stuehrenberg, L.C.; Miller, D.R.; Sims, C.W. (National Marine Fisheries Service, Seattle, WA (USA). Coastal Zone and Estuarine Studies Div.). Dec 1985. Contract AI79-83BP39644. 189p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86008914.

The migration routes of downstream migrant salmonids in the forebay of John Day Dam were defined and assessed in relation to current velocities and water turbidity and temperature. Forebay current patterns were obtained from current meters at fixed sampling stations, the distribution of outmigrants was determined from purse seine sampling, and migration routes of yearling chinook salmon and steelhead were identified by radio telemetry techniques. All species of emigrating salmonids alter their distribution across the forebay as they approach the dam. Fish abundance was positively correlated with water clarity. There was no evidence to suggest that the migration routes were in response to current patterns in the forebay. Radio telemetry studies demonstrated that a certain segment of yearling chinook salmon approaching the dam are predisposed to spill passage (Washington side of the river) by virtue of their lateral position across the forebay. A new application of radio tag methodology was assessed and found to be useful in evaluating the effectiveness of spill for bypassing outmigrant salmon. A program system and cartographic model was developed which displays for any specified hour forebay current patterns at prevailing river flows and dam operations. The system can be used at other dam sites where investigations may wish to detail forebay current patterns.

29495 (TVA/ONRED/AWR—85/7) Costs of reservoir releases aeration. Lewis, A.R.; Bohac, C.E. (Tennessee Valley Authority, Chattanooga (USA); Tennessee Valley Authority, Chattanooga (USA). Div. of Air and Water Resources). Dec 1984. 77p. NTIS, PC A05/MF A01. File Number DE86901131.

Reservoir releases sometimes lack sufficient amounts of dissolved oxygen (DO) to assimilate wastes or to support aquatic life. Various types of aeration technology have been investigated, including turbine hub baffles, draft tube baffles, compressed air injected into the draft tube, compressed air injected through the headcover, and oxygen injected into the reservoir. To evaluate the feasibility of improving DO by various aeration techniques, TVA installed temporary aeration systems at several sites and conducted tests of their performance. Based on these experiments, TVA estimated the costs of installing and operating permanent aeration systems at several of its hydropower projects. This report describes the aeration alternatives investigated, documents current estimates of initial and annual costs for each alternative, and presents a general evaluation of the aeration methods based on their estimated costs and aeration capabilities.

1307 Power-conversion Systems

REFER ALSO TO CITATION(S) 29495

14 SOLAR ENERGY

29496 (DOE/CS/30475—T3) Summary report on International Solar Commercialization/International Market Development Program. (Human Resources Management, Inc., Washington, DC (USA)). 1981. Contract AC05-84OR21400. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010150.

The development program on the international solar commercialization/international market is summarized. The key aspects of the US international solar and renewable energy sales include commercialization, technical cooperation, and development assistance.

1401 Resources And Availability

REFER ALSO TO CITATION(S) 29517

29497 **(DOE/BP/24574—2) Pacific Northwest Solar Radiation Data.** (Oregon Univ., Eugene (USA). Solar Monitoring Lab.). 1 Apr 1986. Contract AC79-81BP24574. 264p. NTIS, PC A12/MF A01; 1; GPO Dep. File Number DE86009635.

The University of Oregon (UO) Solar Monitoring Laboratory has been making solar radiation measurements since 1975. Principal support for this work comes from the Bonneville Power Administration (BPA), along with the Eugene Water and Electric Board (EWEB) for the Eugene station, Washington Water Power (through a subcontract from the University of Idaho) for the Coeur d'Alene site and Pacific Power and Light (PP & L) for the Hood River site. This booklet is the final solar radiation report published under the auspices of BPA and contains all data gathered through December 31, 1985. Discussion of the data handling procedures and the accuracy of the data are included in the overview of the solar radiation network at the beginning of this booklet. A summary of the data follows in the form of monthly averaged and long term hourly averaged tables for each site. A comprehensive listing of the daily data is given at the end of the book. Hourly data for all direct monitoring sites are available from BPA except for Eugene, Coeur d'Alene, and Hood River. The hourly Eugene data are available from EWEB while the Coeur d'Alene data are available from the University of Idaho. Fifteen minute Hood River data are available from PP & L.

29498 (MRI/SOL—1901, pp 517-558) **Solar radiation on different oriented vertical surfaces: Riyadh case study.** Saleh, M.A.E. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

It is known that the solar radiation falling onto a building enclosure will contribute directly to the thermal load of the enclosed spaces of the building. The amount of load will depend primarily on the amount of solar radiation falling onto these surfaces and the thermophysical properties of the materials of these surfaces. The amount of the solar radiation components falling onto different oriented surfaces has been estimated using physical formulae and constants developed mainly by ASHRAE. Mathematical algorithms were developed to model the hourly solar radiation components falling onto vertical surfaces starting from north via east direction stepping every single angle. The mathematical model was programmed to do extensive calculation of three clear sky days with hourly local time representing spring, summer, and winter for Riyadh, Saudi Arabia. With respect to solar application, the result of this study will clarify to the architects and engineers, in graphical means, the importance of orientation of vertical building components which will aid them in design.

29499 (MRI/SOL—1901, pp 559-573) **Computer model for evaluation of form factors and interreflected radiant exchange for irregular geometrics with partial obstruction.** Numan, M.Y. (King Faisal Univ., Dammam, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Simulation and analysis of radiant interchange, among diffusely emitting and reflecting surfaces, in thermal and lighting models require knowledge of the form factors. The form factor is a measure of the diffuse radiation transfer from one surface to another. Experimental, numerical and analytical techniques were used to obtain the form factors for a wide range of geometries, where the surfaces are in full view of each other. But the application of contour integration greatly simplified the evaluation of the form factor. It provided the basis for a general analytical solution for the calculation of the form factors between rectilinear finite surfaces. Architectural spaces are often of complex and irregular geometries with partially obstructed views. The evaluation of the form factors, in such cases, is an unwieldy problem. Finite element algorithms, although often used, are inherently CPU time consuming and computationally inefficient. The development of the algorithmic model is discussed and the procedures for its computer implementation are outlined. These provided the basis for the computer program FOFACT. Application of the model is illustrated by examples obtained by FOFACT.

1403 Economics

REFER ALSO TO CITATION(S) 29563

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 29457, 29458, 29461, 29462, 29463, 29464, 29465, 29466, 29467, 29468, 29469, 29470, 29471, 29472, 29473, 29474, 29475, 29476, 29477, 29478, 29479, 29480, 29481, 29482, 29483, 29562, 29563, 29611, 30225, 30241, 30252, 30283, 30291, 30292

29500 (CONF-8405400—, pp 153-207) **India's experiment with community biogas plants. Case study.** Moulik, T.K.; Murthy, N.; Subramaniam, A. (Indian Inst. of Management, Ahmedabad). 1984. NTIS (US Sales Only), PC A22/MF A01. File Number DE86751710.

From International biogas workshop on community plants; Bremen, F.R. Germany (1 May 1984).

The Department of Science and Technology, Government of India, initiated a pilot project of installing community biogas plants (CB) in 20 selected villages of India in early 1981. Each of the 20 villages sites selected was to have a gobar digester, a human waste digester and three batch type digesters for processing agricultural waste. There was also provision for a storage tank, an engine-cum-office room and a water tank. A supervisor and an assistant would be available for operating the plant. Families receiving gas supply could be helped by the project to procure stoves. The project provided pipelines for gas distribution, an engine, generator, chaff cutter and flour mill. The experience with this project in a lot of villages is reported. (orig./EF).

29501 **(DOE/ER/10803—5) Guard cell biochemistry: response to environmental stimuli causing changes in gas exchange.** Outlaw, W.H. Jr. (Florida State Univ., Tallahassee (USA)). [1986]. Contract AS05-81ER10803. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010287.

Our understanding of how the light reactions of photosynthesis influence carbon metabolism in guard cells is rudimentary. This state of affairs is understandable; reliable reports of PS II in guard cells were published only two years ago. At this point, I wish to warn against complacency in drawing strict analogies between guard cell chloroplast function and that in other cells. In general, guard cell chloroplasts and their mesophyll counterparts differ in morphology, for example, the guard cell organelles are smaller, less abundant, and paler, have fewer thylakoids/granna, have areas of peripheral reticulum, and contain relatively more starch. One biochemical difference underlying these morphological ones has already been identified (fluorescence kinetics). 107 refs., 11 figs., 2 tabs.

29502 **(DOE/ER/12015—T1) Depletion of photosystem 2 extrinsic proteins. I. Effects of O_2 and N_2 flash yields and steady state O_2 evolution.** Radmer, R.; Cammarata, K.; Tamura, N.; Ollinger, O.; Cheniae, G. (Martek Corp., Columbia, MD (USA); Kentucky Univ., Lexington (USA). Dept. of Agronomy; Martin Marietta Labs., Baltimore, MD (USA). Biosciences Dept.). [1985]. Contract AC02-82ER12015. 40p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009231.

Wheat O_2 evolving PS 2 membranes, having a PS 2 unit of ~200 Chls less than 1 P700/3000 Chl and an electron acceptor pool of ~2.5 equivs/PS 2, were analyzed and compared with wheat PS 2 membranes depleted of the 17,23 kD proteins by NaCl extraction during Triton X-100 isolation of membranes. Extraction of these proteins caused ~50% decrease in O_2 evolution in any light regime and an increase of ~2 equivs/PS 2 of the electron acceptor pool, but affected neither Mn abundance, photoreduction of

DCIP by tetraphenylboron, or N_2 yield (from NH_3OH) from a single flash. Mass spectrometric analyses of O_2 flash yields in the presence of FeCN showed that both chloroplasts and the unextracted PS 2 membranes yielded oscillations compatable with S_0, S_1, S_2, S_3 of 25:75:0:0 and α (0.1) and β (0.05). Depletion of 17,23 kDa proteins resulted in a two-fold increase in α, ~25 to 40% disconnection of the S-state complex from the PS 2 trap complex but with no change in β. Preincubation of control or extracted PS 2 mambranes with FeCN permitted a significant double-hit on the first flash. 49 refs., 9 figs., 2 tabs.

29503 **(DOE/ER/13234—2) Gas exchange characteristics of leaves as indicators of the basic limitations to the rate of photosynthesis. Second annual report, 1 June 1985-31 May 1986.** Sharkey, T.D. (Nevada Univ., Reno (USA). Desert Research Inst.). 1986. Contract FG08-84ER13234. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009632.

The response of photosynthesis to light, CO_2 and O_2 is studied by measuring the exchange of gases (water vapor and CO_2) between the atmosphere and the leaf. These measurements are combined with measurements of metabolite levels and enzyme activities which can disclose the molecular events which limit or regulate the rate of photosynthesis. The purpose of this research is to identify the underlying molecular events which give rise to easily measured photosynthetic characteristics so that those processes which are most important in regulating or limiting photosynthesis in leaves can be identified. A significant result of this research has been the identification of the cause of O_2 insensitive photosynthesis in C_3 plants. It has been determined that this anomalous behavior is caused by deactivation of the primary carboxylating enzyme, RuBP carboxylase, in low O_2. It is believed that this deactivation occurs because the plant is unable to use all of the products of photosynthesis that could be made if deactivation did not occur. Current efforts are directed toward understanding how this deactivation may be advantageous to the plant and how rapidly it can occur. 30 refs., 1 fig., 3 tabs.

29504 **(DOE/JPL/1012—112) High-efficiency silicon solar-cell design and practical barriers.** Mokashi, A.R.; Daud, T.; Kachare, R.H. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Nov 1985. Contract AI01-76ET20356. 27p. (JPL-PUB—85-75). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010242.

A numerical evaluation technique is used to study the impact of practical barriers, such as heavy doping effects (Auger recombination, band gap narrowing), surface recombination, shadowing losses and minority-carrier lifetime (tau), on a high efficiency silicon solar cell performance. A hypothetical case, considering only radiative recombination losses and ignoring technology limited and fundamental losses is evaluated to estimate highest efficiency. Considering a high tau of 1 ms, efficiency of a silicon solar cell of the hypothetical case is estimated to be around 29%. This is comparable with (detailed balance limit) maximum efficiency of a p-n junction solar cell of 30%, estimated by Shockley and Queisser. Value of tau is varied from 1 second to 20 μs. Heavy doping effects, and realizable values of surface recombination velocities and shadowing, are then considered in succession and their influence on cell efficiency is evaluated and quantified. It is shown that these practical barriers cause the cell efficiency to reduce from the maximum value of 29% to the experimentally achieved value of about 19%. Improvement in open circuit voltage (V/sub oc/) is required to achieve cell efficiency greater than 20%. Increased value of tau reduces reverse saturation current and, hence, improves V/sub oc/. Control of surface recombination losses becomes critical at higher V/sub oc/. Substantial improvement in tau and considerable reduction in surface recombination velocities is essential to achieve cell efficiencies greater than 20%. Lack of available data for minority-carrier mobility, heavy doping effect, tau in thin emitters, surface recombination velocities, etc., are discussed. Limitations of one dimensional numerical analysis for considering two- and three-dimensional cell designs, such as floating emitter and dot junction cells, are pointed out.

29505 **(DOE/JPL/956679—84/6) Ink jet printing of silver metallization for photovoltaics. Quarterly technical report, January 1-March 31, 1986.** Vest, R.W. (Purdue Research Foundation, Lafayette, IN (USA)). 23 Apr 1985. Contract NAS-7-100-956679. 48p. (DRL—207; DRD-SE—2). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009833.

Tests were conducted which confirm that high contact resistance was the major limiting factor in producing high efficiency solar cells. It was demonstrated that high quality cells can be produced using silver MOD inks printed with an ink jet system if the contact resistance can be reduced to acceptable levels. Other experiments were conducted to study the effects of the thermal processes and furnace atmospheres on solar cells. Experiments conducted to find an appropriate interfacing material which would reduce the contact resistance of the solar cells did not yield such a material. Experiments were conducted to determine if multiple printing and firing of solar cells gave consistent results. An IBM/AT computer was interfaced with the ink jet system. A theoretical analysis of the fluid mechanics of the ink jet printing head was completed. (LEW)

29506 **(ESA-SP—30) Proceedings of ESA sessions at the 16th IEEE annual power electronics specialists conference.** Burke, W.R. (European Space Agency, 75 - Paris (France)). May 1985. 339p. (CONF-850656—). NTIS, PC A15/MF A01.

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

Spacecraft power supplies; power converters and inverters; power system simulation; battery and solar array systems; power equipment; high voltage power systems; and power unit simulation were discussed.

29507 (ESA-SP—30, pp vp) **MARECS and ECS: the first few years in orbit.** Leggett, P. May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

The MARECS/ECS power subsystem and its in-orbit performance are described. The MARECS A, MARECS B2 and ECS 1 and 2 spacecraft have basically the same power subsystem and from the viewpoint of delivery of power to the users all perform in a totally nominal way. The bus voltage shows no tendency to drift and the loss of array sections does not disturb system operation. The modularity and redundancy incorporated in the power system enable an uninterrupted flow of regulated power to be maintained to users in spite of anomalies encountered on MARECS A. Modifications incorporated on subsequent spacecraft avoided the problems of MARECS A. The solar arrays appear to be degrading at a rate less than the typical values estimated and the batteries are now all controlled by an ampere hour technique which should provide a long lifetime for the power subsystem.

29508 (ESA-SP—30, pp vp) **Telecom 1 power subsystem from design to flight.** Barde, H. May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

The unregulated power subsystem of Telecom 1 is presented. Primary power is provided by a solar array. Solar array Sun tracking is ensured by the Bearing And Power Transfer Assembly (BAPTA) driven by the solar array drive electronics. Solar array power is routed on board through the BAPTA sliprings, where a diode network generates two main buses and a Sun bus, which is not battery supported during eclipse. Secondary power is derived from two NiCd batteries, each dedicated to a main bus. On sunlight, the batteries are not connected to the buses, hence the operating point is defined only by the solar array characteristic and spacecraft load. The power management unit houses the functions of battery connection/disconnection, battery charge and reconditioning, solar array power triming and power subsystem telemetry. A battery control unit ensures battery and cell voltage monitoring, as well as battery protection by end of charge and end of discharge signal generation. 1 reference.

29509 (ESA-SP—30, pp vp) **Giotto power supply subsystem.** Re, E. May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

The requirements and components of the Giotto power supply subsystem are described. Requirements are: transfer of electrical power between the solar array, the batteries, and spacecraft loads (including each experiment); main bus voltage control using shunt and battery discharge regulation; switching and protection electronics for the experiments, the heaters, and other spacecraft systems; transfer of power to the AOCMS, data handling subsystems, and the despin motor control electronics from dedicated converters; and provision of telecommand and telemetry functions to operate and monitor the system configuration and functioning. The major components are: power control unit; power distribution unit; four batteries; battery regulator units containing a battery discharge regulator and a battery charge regulator; data handling converter; service converter; and external power dumpers (dissipative elements of the shunt regulator). 1 reference.

29510 (ESA-SP—30, pp vp) **ERS-1 power system.** Haines, J.E.; Mccarthy, C.; Poncin, A. (Etudes Techniques et Constructions Aerospatiales, Charleroi, Belgium). May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

The ERS-1 electrical power system is described. The power system is based on that of the SPOT platform and consists of a battery defined power bus together with a solar array shunt regulator able to control on battery recharge current and selectable end of charge voltage level. The system comprises a 2.1 kW beginning of life solar array, 4 parallel connected 24 Ahr batteries and a shunt regulator which effects the power control between the power source and energy storage system. The Power Distribution Unit (PDU) in the platform distributes power to the instruments via a second PDU integrated in the payload. Primary power is distributed by unregulated and regulated voltage power lines to the platform and payload users. Within the payload two high power buses exist, one dedicated to the high power amplifier of the Active Microwave Instrument, which requires an peak power of 1 kW, the other serves the remaining payload equipments. The platform consumes 300 W continuously.

29511 (ESA-SP—30, pp vp) **Photovoltaic array simulation.** Liu, G.; Dunford, W.G. May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

Two approaches to the simulation of photovoltaic arrays are compared. The first involves the use of a pilot panel and variable light source. In the second, characteristic array curves are stored in the memory of a microprocessor-based simulator. For the first approach, a stability analysis based on Popov's method is presented. Experimental results are presented for both systems. Type 1 is suitable where a field test of a particular panel type is required, while type 2 is suitable for experiments demanding fixed irradiation and temperature levels for a period of time. The experimental results are satisfactory in terms of steady state accuracy and feasibility. The stability analysis program enables the parameters to be adjusted in the type 1 simulator to assume the stability of the system.

29512 (ESA-SP—30, pp vp) **Computer analysis tool for evaluation of solar array design.** Fieux, B.; Masson, J. (ESA/ESTEC, Noordwijk, Netherlands). May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

A computer tool for evaluating solar array design through definition and/or recall of input design parameters, and output of partial or final results of performances of the simulated solar array was developed. Simulation capabilities include: modeling of a solar cell as a function of physical parameters, temperature and radiation fluxes (Si or Ga As); identification of solar cell parameters from a set of measured experimental curves; evaluation of the solar array curve as a function of cell assembly, orbital environment; evaluation of solar array mean power versus life time; and evaluation of operating point with respect to the load characteristic and orbital position. 1 reference.

29513 **(GA-A—18285) High-pressure catalytic metal reactor in a simulated solar central receiver.** (GA Technologies, Inc., San Diego, CA (USA)). Feb 1986. Contract AC03-83SF11929. 319p. NTIS, PC A14/MF A01; 1; GPO Dep. File Number DE86009082.

A high-pressure catalytic metal reactor was built and tested in a simulated solar central receiver. This test was a second step towards determining the feasibility of metallic reactors for the Solar Fuels and Chemicals Program. The project was aimed at further developing the data base for the use of metallic reactors in a solar environment. The chemical reaction chosen for this test was the decomposition of sulfuric acid at 870°C (1598°F), 0.5 kg/min of acid, and pressure up to 10 atm ($10.1*10^2$MPa). Major achievements included an evaluation of the thermal performance of the reactor both at steady-state and in response to an upset condition. The steady-state tests provided data on the heat losses from the system and thereby the thermal efficiency. The transient tests provided measurement of the system's time constants for three different forcing functions: power input, process fluid flow rate, and process pressure. The chemical kinetics were also evaluated for two different catalysts and computer estimates were made for the Arrhenius rate constants. 8 refs., 94 figs., 22 tabs.

29514 (MRI/SOL—1901, pp 679-702) **Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia.** Oglu, E.N.A. (King Faisal Univ., Dammam, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The results of an architectural design concept and its potential viability of combining passive and active solar systems together with prefabrication of construction methods resulting in a versatile and energy-sufficient housing unit are presented. Solar photovoltaic conversion as well as the bases for energy-sufficiency are reviewed, as is an analysis of energy need and supply. The role of a self-sufficient habitat is discussed in relationship to isolated communities, and a potential study of the cultural, ecological and economic significance for rural settlements would provide useful insight for contemporary architecture in Saudi Arabia.

29515 **(N—86-16726) Design, performance investigation and delivery of a miniaturized Cassegrainian concentrator solar array. Final technical report.** Patterson, R.E. (TRW, Inc., Redondo Beach, CA (USA)). May 1985. 86p. (NASA-CR—178571; REPT—42977-6002-UT-00). NTIS, PC A05/MF A01.

A miniaturized Cassegrainian concentrator (MCC) solar array concept is being developed with the objective of significantly reducing the recurring cost of multikilowatt solar arrays. The desired cost reduction is obtained as a result of using very small high efficiency solar cells in conjunction with low-cost optics. In the MCC single element concept and panel concept, incident solar radiation is reflected from a primary parabolic reflector to a secondary hyperbolic reflector and finally to a 4-millimetr diameter solar cell. A light catcher cone is used to improve off-axis performance. An element is approximately 13-millimeters thick which permits efficient launch stowage of the concentrator system panels without complex optical component deployments or retractions. The MCC elements are packed in bays within graphite epoxy frames and are electrically connected into appropriate series-parallel circuits. A MCC single element with a 21 sq cm entrance aperture and a 20 percent efficient, 0.25 sq cm gallium arsenide solar cell has the same power output as 30-sq cm of 11-percent efficiency (at 68 C) silicon solar cells. The MCC concept provides the potential for a significant reduction in array cost due to a 99 percent reduction in required cell area and a 30 percent reduction in array area relative to planar array of equivalent power.

29516 (N—86-17839) **Space photovoltaic research and technology 1985: high efficiency, space environment, and array technology.** (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1985. 282p. (NASA-CP—2408; E—2706; CONF-8504230—). NTIS, PC A13/MF A01.

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The seventh NASA Conference on Space Photovoltaic Research and Technology was held at NASA Lewis Research Center, Cleveland, Ohio, from 30 April until 2 May 1985. Its purpose was to assess the progress made, the problems remaining, and future strategy for space photovoltaic research. Particular emphasis was placed on high efficiency, space environment, and array technology.

29517 (N—86-17839, pp vp) **Overview of SERI's high efficiency solar cell research.** Benner, J.P.; Cole, L.A.; Leboeuf, C.M. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The bulk of the research efforts supported by the Solar Energy Research Institute (SERI) High Efficiency Concepts area has been directed towards establishing the feasibility of achieving very high efficiencies, 30% for concentrator and more than 20% for thin film flat plate, in solar cell designs which could possibly be produced competitively. The research has accomplished a great deal during the past two years. Even though the desired performance levels have not yet been demonstrated, based on the recent progress, a greater portion of the terrestrial photovoltaics community believes that these efficiencies are attainable. The program will now allocate a larger portion of resources to low cost, large area deposition technology. The program is currently shifting greater emphasis on to the study of crystal growth in order to provide the understanding and tools needed to design a large area process.

29518 (N—86-17839, pp vp) **Further research on high open circuit voltage in silicon solar cells.** Spitzer, M.B.; Keavney, C.J. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The results of a new research on the use of controlled dopant profiles and oxide passivation to achieve high open circuit voltage V sub oc in silicon solar cells is presented. Ion implantation has been used to obtain nearly optimal values of surface dopant concentration. The concentrations are selected so as to minimize heavy doping effects and thereby provide both high blue response and high V sub oc. Ion implantation techniques have been successfully applied to the fabrication of both n-type and p-type emitters. V sub oc of up to 660 mV is reported and AMO efficiency of 16.1% has been obtained.

29519 (N—86-17839, pp vp) **Gallium arsenide solar cell efficiency: problems and potential.** Weizer, V.G.; Godlewski, M.P. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Under ideal conditions the GaAs solar cell should be able to operate at an AMO efficiency exceeding 27 percent, whereas to date the best measured efficiencies barely exceed 19 percent. Of more concern is the fact that there has been no improvement in the past half decade, despite the expenditure of considerable effort. State-of-the-art GaAs efficiency is analyzed in an attempt to determine the feasibility of improving on the status quo. The possible gains to be had in the planar cell. An attempt is also made to predict the efficiency levels that could be achieved with a grating geometry. Both the N-base and the P-base GaAs cells in their planar configurations have the potential to operate at AMO efficiencies between 23 and 24 percent. For the former the enabling technology is essentially in hand, while for the latter the problem of passivating the emitter surface remains to be solved. In the dot grating configuration, P-base efficiencies approaching 26 percent are possible with minor improvements in existing technology. N-base grating cell efficiencies comparable to those predicted for the P-base cell are achievable if the N surface can be sufficiently passivated.

29520 (N—86-17839, pp vp) **N/P GaAs concentrator solar cells with an improved grid and bushbar contact design.** Desalvo, G.C.; Mueller, E.H.; Barnett, A.M. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The major requirements for a solar cell used in space applications are high efficiency at AMO irradiance and resistance to high energy radiation. Gallium arsenide, with a band gap of 1.43 eV, is one of the most efficient sunlight to electricity converters (25%) when the the simple diode model is used to calculate efficiencies at AMO irradiance, GaAs solar cells are more radiation resistant than silicon solar cells and the N/P GaAs device has been reported to be more radiation resistant than similar P/N solar cells. This higher resistance is probably due to the fact that only 37% of the current is generated in the top N layer of the N/P cell compared to 69% in the top layer of a P/N solar cell. This top layer of the cell is most affected by radiation. It has also been theoretically calculated that the optimized N/P device will prove to have a higher efficiency than a similar P/N device. The use of a GaP window layer on a GaAs solar cell will avoid many of the inherent problems normally associated with a GaAlAs window while still proving good passivation of the GaAs surface. An optimized circular grid design for solar cell concentrators has been shown which incorporates a multi-layer metallization scheme. This multi-layer design allows for a greater current carrying capacity for a unit area of shading, which results in a better output efficiency.

29521 (N—86-17839, pp vp) **High-efficiency AlGaAs-GaAs Cassegrainian concentrator cells.** Werthen, J.G.; Hamaker, H.C.; Virshup, G.F.; Lewis, C.R.; Ford, C.W. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

AlGaAs-GaAs heteroface space concentrator solar cells have been fabricated by metalorganic chemical vapor deposition. AMO efficiencies as high as 21.1% have been observed both for p-n and np structures under concentration (90 to 100X) at 25 C. Both cell structures are characterized by high quantum efficiencies and their performances are close to those predicted by a realistic computer model. In agreement with the computer model, the n-p cell exhibits a higher short-circuit current density.

29522 (N—86-17839, pp vp) **Evaluation of AlsubxGasub1-xsubAs solar cells.** Loo, R.Y.; Kamath, G.S.; Knechtli, R.C.; Narayanan, A.; Li, S.S. (Florida Univ., Gainesville). 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Single junction GaAs solar cells have already attained an efficiency of 19% AMO which could potentially be increased to approx 20%, with some optimization. To achieve the higher efficiency the concept of multibandgap solar cells which utilizes a wider region of the solar spectrum should be used. One of the materials for fabricating the top cell in a multibandgap solar cell is AlGaAs because it is compatible with GaAs in bandgap and lattice match. This is a very important consideration from the materials technology point of view, and the viability of this approach is evaluated.

29523 (N—86-17839, pp vp) **GaAsP on GaP top solar cells.** McNeely, J.B.; Negley, G.H.; Barnett, A.M. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

GaAsP on GaP top solar cells as an attachment to silicon bottom solar cells are being developed. The GaAsP on GaP system offers several advantages for this top solar cell. The most important is that the gallium phosphide substrate provides a rugged, transparent mechanical substrate which does not have to be removed or thinned during processing. Additional advantages are that: (1) gallium phosphide is more oxidation resistant than the III-V aluminum compounds, (2) a range of energy band gaps higher than 1.75 eV is readily available for system efficiency optimization, (3) reliable ohmic contact technology is available from the light-emitting diode industry, and (4) the system readily lends itself to graded band gap structures for additional increases in efficiency.

29524 (N—86-17839, pp vp) **Vacuum MOCVD fabrication of high efficience cells.** Partain, L.D.; Fraas, L.M.; Mcleod, P.S.; Cape, J.A. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Vacuum metal-organic-chemical-vapor-deposition (MOCVD) is a new fabrication process with improved safety and easier scalability due to its metal rather than glass construction and its uniform multiport gas injection system. It uses source materials more efficiently than other methods because the vacuum molecular flow conditions allow the high sticking coefficient reactants to reach the substrates as undeflected molecular beams and the hot chamber walls cause the low sticking coefficient reactants to bounce off the walls and interact with the substrates many times. This high source utilization reduces the materials costs power device and substantially decreases the amounts of toxic materials that must be handled as process effluents. The molecular beams allow precise growth control. With improved source purifications, vacuum MOCVD has provided p GaAs layers with 10-micron minority carrier diffusion lengths and GaAs and GaAsSb solar cells with 20% AMO efficiencies at 59X and 99X sunlight concentration ratios. Mechanical stacking has been identified as the quickest, most direct and logical path to stacked multiple-junction solar cells that perform better than the best single-junction devices. The mechanical stack is configured for immediate use in solar arrays and allows interconnections that improve the system end-of-life performance in space.

29525 (N—86-17839, pp vp) **Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells.** Blakeslee, A.E.; Kibbler, A. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Superlattices of GaAs(1-x)p(x) are being incorporated into cascade solar cell structures in order to reduce the dislocation density in the top cells and thus reduce recombination loss and increase output voltage. For a superlattice to effectively block the propagation of dislocations its average composition must be equal to that of the layer beneath it (from efficiency considerations for a cascade cell, the average composition should be about GaAs(.7)P(.3). When superlattices of this approximate composition were grown on GaAs by MOCVD, severe distortion of the crystal layers was observed. The essential features of this distortion are nonplanar morphology and accelerated etching in regions containing excess phosphorus and clusters of dislocations. Similar observations have been made with superlattices grown with two other MOCVD systems, indicating that the problem is of fundamental technological significance, not just an artifact of one particular growth system. The nature of the distortion effect is described, and several strategies for preventing its occurrence are presented.

29526 (N—86-17839, pp vp) **Superlattices and multilayer structures for high efficiency solar cells.** Wagner, M.; Leburton, J.P. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Possible applications of superlattices to photovoltaic structures are discussed. A new concept based on doping superstructures (NIPI) can be exploited to significantly reduce recombination losses in III-V compound solar cells. A novel multijunction structure with lateral current transport is proposed. A computer simulation has been performed which shows that by optimizing the multilayer structure, short circuit current is substantially increased with minimum drop in open circuit voltage. An additional advantage of the structure is enhanced radiation tolerance. It is anticipated that this multilayer structure can be incorporated in multibandgap cells to achieve high efficiencies.

29527 (N—86-17839, pp vp) **Possible radiation-resistant solar cell geometry using superlattices.** Goradia, C.; Clark, R.; Brinker, D. (Cleveland State Univ., Ohio). 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

A solar cell structure is proposed which uses a GaAs nipi doping superlattice. An important feature of this structure is that photogenerated minority carriers are very quickly collected in a time shorter than bulk lifetime in the fairly heavily doped n and p layers and these carriers are then transported parallel to the superlattice layers to selective ohmic contacts. Assuming that these already-separated carriers have very long recombination lifetimes, due to their across an indirect bandgap in real space, it is argued that the proposed structure may exhibit superior radiation tolerance along with reasonably high beginning-of-life efficiency.

29528 (N—86-17839, pp vp) **Experience with OMCVD production of GaAs solar cells.** Yeh, Y.C.M.; Iles, P.A.; Ho, P.; Ling, K.S. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The projected promise of the OMCVD approach, i.e., to make high efficiency GaAs space cells, has been demonstrated. The properties and control of the deposited GaAs and AlGaAs layers and the uniformity of the post layer processing have been most satisfactory. In particular the control of the critical thin layers (p-GaAs, p-AlGaAs) has been impressive. Experience has also been gained in routine areas, connected with continuous operation at high capacity. There are still a few areas for improvement, to further increase capacity, and to anticipate and prevent mechanical equipment problems.

29529 (N—86-17839, pp vp) **Burst annealing of electron damage in silicon solar cells.** Day, A.C.; Horne, W.E.; Thompson, M.A.; Lancaster, C.A. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

A study has been performed of burst annealing of electron damage in silicon solar cells. Three groups of cells consisting of 3 and 0.3 ohm-cm silicon were exposed to fluences of 2 x 10 to the 14th power, 4 x 10 to the 14th power, and 8 x 10 to the 14th power 1-MeV electrons/sq cm, respectively. They were subsequently subjected to 1-minute bursts of annealing at 500 C. The 3 ohm-cm cells showed complete recovery from each fluence level. The 0.3 ohm-cm cells showed complete recovery from the 2 x 10 to the 14th power e/sq cm fluence; however, some of the 0.3 ohm-cm cells did not recover completely from the higher influences. From an analysis of the results it is concluded that burst annealing of moderate to high resistivity silicon cell arrays in space is feasible and that with more complete understanding, even the potentially higher efficiency low resistivity cells may be usable in annealable arrays in space.

29530 (N—86-17839, pp vp) **I-V-T analysis of radiation damage in high efficiency Si solar cells.** Banerjee, S.; Anderson, W.A.; Rao, B.B. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

A detailed analysis of current-voltage characteristics of N(+)-P/P solar cells indicate that there is a combination of different mechanisms which results in an enhancement in the dark current and in turn deteriorates the photovoltaic performance of the solar cells after 1 MeV e(-) irradiation. The increase in the dark current is due to three effects, i.e., bulk recombination, space charge recombination by deep traps and space charge recombination through shallow traps. It is shown that the increase in bulk recombination current is about 2 to 3 orders of magnitude whereas space charge recombination current due to shallow traps increases only by an order or so and no space charge recombination through deep traps was observed after irradiation. Thus, in order to improve the radiation hardness of these devices, bulk properties should be preserved.

29531 (N—86-17839, pp vp) **Influence of design variables on radiation hardness of silicon MINP solar cells.** Anderson, W.A.; Solaun, S.; Rao, B.B.; Banerjee, S. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Metal-insulator-N/P silicon (MINP) solar cells were fabricated using different substrate resistivity values, different N-layer designs, and different I-layer designs. A shallow junction into an 0.3 ohm-cm substrate gave best efficiency whereas a deeper junction into a 1 to 4 ohm-cm substrate gave improved radiation hardness. I-layer design variation did little to influence radiation hardness.

29532 (N—86-17839, pp vp) **Radiation damage in high-resistivity silicon solar cells.** Weinberg, I.; Swartz, C.K.; Goradia, C. (Cleveland State Univ., Ohio). 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

High-resistivity silicon solar cells exhibit reduced radiation damage when light is incident on the gridded back surface. Under back illumination, radiation damage decreases as cell resistivity increases; under front illumination, radiation damage increases as cell resistivity increases. Thin back-illuminated cells outperform conventional 10 omega cm 50 and 200 micron cells at low 1-MeV electron fluences. However, at higher fluences, the conventional cells exhibit superior radiation resistance. This is attributed to the low BOL diffusion lengths observed in the thin, sack-illuminated cell. These results are discussed in terms of injected charge distributions, electric fields in the cell base, and the effects of a dominant boron-oxygen defect.

29533 (N—86-17839, pp vp) **Photon radiation effects on CdS/CuInSe2 thin film solar cells.** Dursch, H.; Chen, W.; Rusell, D. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The unknown tolerance of CuInSe2 cells to proton irradiation was tested. It was shown that CdS/CuInSe2 solar cells have an inherent tolerance to irradiation by 1 MeV electrons up to at least 2 x 10 to the 16th power electrons/sq cm. Eleven, unencapsulated, 1 sq cm cells deposited on alumina substrates were irradiated with 1 MeV protons at normal incidence. The cells were exposed to six fluences ranging from 2.5 x 10 to the 10th power protons/sq cm to 5.0 x 10 to the 13th power protons/sq cm. After each interval of exposure, the cells were removed from the radiation chamber to undergo current/voltage characterization. It is shown that none of the cells electrical characteristics exhibited any degradation up to and including a fluence of 1 x 10 to the 11th power protons/sq cm. At fluences greater than this, the damage to the CuInSe2 cells V sub oc and fill factor (FF) was more severe than that exhibited by the Isc. The CuInSe2 cells proved to be approximately a factor of 50 more resistant to 1 MeV proton irradiation than silicon or gallium arsenide cells. Annealing of a CuInSe2 cell at 225 deg C for 6 minutes restored it to within 95% of its initial efficiency.

29534 (N—86-17839, pp vp) **DLTS analysis of radiation-induced defects in one-MeV electron irradiated germanium and Alsub0.17Gasub0.83As solar cells.** Li, S.B.; Choi, C.G.; Loo, R.Y. (Hughes Research Labs., Malibu, CA). 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The radiation-induced deep-level defects in one-MeV electron-irradiated germanium and AlxGal-xAs solar cell materials using the deep-level transient spectroscopy (DLTS) and C-V techniques were investigated. Defect and recombination parameters such as defect density and energy levels, capture cross sections and lifetimes for both electron and hole traps were determined. The germanium and AlGaAs p/n junction cells were irradiated by one-MeV electrons. The DLTS, I-V, and C-V measurements were performed on these cells. The results are summarized as follows: (1) for the irradiated germanium samples, the dominant electron trap was due to the E sub - 0.24 eV level with density around 4x10 to the 14th power 1/cu cm, independent of electron fluence, its origin is attributed to the vacancy-donor complex defect formed during the electron irradiation; (2) in the one-MeV electron irradiated Al0.17Ga0.83 as sample, two dominant electron traps with energies of Ec-0.19 and -0.29 eV were observed, the density for both electron traps remained nearly constant, independent of electron fluence. It is shown that one-MeV electron irradiation creates very few or no new deep-level traps in both the germanium and AlxGa1-xAs cells, and are suitable for fabricating the radiation-hard high efficiency multijunction solar cells for space applications.

29535 (N—86-17839, pp vp) **Depletion layer recombination effects on the radiation damage hardness of gallium arsenide cells.** Garlick, G.F.J. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The significant effect of junction depletion layer recombination on the efficiency of windowed GaAs cells was demonstrated. The effect becomes more pronounced as radiation damage occurs. The depletion is considered for 1 MeV electron fluences up to 10 to the 16th power e/sq m. The cell modeling separates damage in emitter and base or buffer layers using different damage coefficients. The lower coefficient for the emitter predicts less loss of performance at fluences greater than 10 to the 15th power e/sq cm. A method for obtaining information on junction recombination effects as damage proceeds is described; this enables a more complete diagnosis of damage to be made.

29536 (N—86-17839, pp vp) **Performance of Hughes GaAs concentrator cells under 1-MeV electron irradiation.** Curtis, H.B.; Swartz, C.K. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Several Hughes gallium arsenide (GaAs) concentrator cells were exposed to 1-MeV electrons at fluences up to 1x10 to the 15th power electrons/sq cm. Performance data were taken after several fluences, at two temperatures, and at concentration levels from 1 to approx. 150x AMO. Data at 1 sun and 25 deg C were taken with an X-25 xenon-lamp solar simulator. Data at concentration were taken using a pulsed solar simulator with the assumption of a linear relationship between short-circuit current and irradiance. The cells are 5 by 5 mm with a 4-mm diameter illuminated area. 1 reference.

29537 (N—86-17839, pp vp) **Two years of on-orbit gallium arsenide performance from the LIPS solar cell panel experiment.** Francis, R.W.; Betz, F.E. (Naval Research Lab., Washington, DC). 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The LIPS on-orbit performance of the gallium arsenide panel experiment was analyzed from flight operation telemetry data. Algorithms were developed to calculate the daily maximum power and associated solar array parameters by two independent methods. The first technique utilizes a least mean square polynomial fit to the power curve obtained with intensity and temperature corrected currents and voltages; whereas, the second incorporates an empirical expression for fill factor based on an open circuit voltage and the calculated series resistance. Maximum power, fill factor, open circuit voltage, short circuit current and series resistance of the solar cell array are examined as a function of flight time. Trends are analyzed with respect to possible mechanisms which may affect successive periods of output power during 2 years of flight operation. Degradation factors responsible for the on-orbit performance characteristics of gallium arsenide are discussed in relation to the calculated solar cell parameters. Performance trends and the potential degradation mechanisms are correlated with existing laboratory and flight data on both gallium arsenide and silicon solar cells for similar environments.

29538 (N—86-17839, pp vp) **PASP: a high voltage array experiment.** Scott-Monck, J.; Morris, R. (AFWAL, Wright-Patterson AFB, OH). 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

In the near future, Air Force mission payloads will require significant increases in power. Sophisticated sensing systems such as infrared focal plane detector arrays and radar will be employed by the Air Force to fulfill its strategic objectives. These payloads will demand that the power subsystem provide up to 50 kW at the end of mission life, more than an order of magnitude greater than is currently required. Some of these payloads must be flown in low-Earth polar orbits to satisfy mission objectives, and it is likely that large (500 to 600 sq m) solar photovoltaic arrays will operate in the low-Earth polar environment. The standard 28 volt power subsystem is not weight efficient for the array power levels being considered. The impact of the solar array operating voltage on the total weight of the array and the subsystem power conditioning and distribution components is illustrated. In the interest of reducing power subsystem weight, higher array operating voltages are considered. The problems which the higher array voltage present to the array designer are discussed. In order to provide a maximum return on the tremendous investment of resources required to develop and place these assets in orbit, they must be designed to operate effectively for extended periods of time. To achieve this, the system must be able to function in the threat-induced and natural space environment.

29539 (N—86-17839, pp vp) **Testing of gallium arsenide solar cells on the CRRES vehicle.** Trumble, T.M. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

A flight experiment was designed to determine the optimum design for gallium arsenide (GaAs) solar cell panels in a radiation environment. Elements of the experiment design include, different coverglass material and thicknesses, welded and soldered interconnects, different solar cell efficiencies, different solar cell types, and measurement of annealing properties. This experiment is scheduled to fly on the Combined Release and Radiation Effects Satellite (CRRES). This satellite will simultaneously measure the radiation environment and provide engineering data on solar cell degradation that can be directly related to radiation damage.

29540 (N—86-17839, pp vp) **Thermal stress cycling of GaAs solar cells.** Janousek, B.K.; Francis, R.W.; Wendt, J.P. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

A thermal cycling experiment was performed on GaAs solar cells to establish the electrical and structural integrity of these cells under the temperature conditions of a simulated low-Earth orbit of 3-year duration. Thirty single junction GaAs cells were obtained and tests were performed to establish the beginning-of-life characteristics of these cells. The tests consisted of cell I-V power output curves, from which were obtained short-circuit current, open circuit voltage, fill factor, and cell efficiency, and optical micrographs, spectral response, and ion microprobe mass analysis (IMMA) depth profiles on both the front surfaces and the front metallic contacts of the cells. Following 5,000 thermal cycles, the performance of the cells was reexamined in addition to any factors which might contribute to performance degradation. It is established that, after 5,000 thermal cycles, the cells retain their power output with no loss of structural integrity or change in physical appearance.

29541 (N—86-17839, pp vp) **Demonstrated results of welded and soldered interconnections.** Hart, R.E. Jr. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Solar cell modules with welded and soldered interconnections were constructed using a flexible substrate material. These modules were thermally cycled between approx. 80 deg C at rates 100 cycles/day to demonstrate survivability under simulated low Earth orbit (LEO) temperature conditions. The modules, cycled in an inert atmosphere, show durability for 36,000 cycles.

29542 (N—86-17839, pp vp) **Thin film coatings for improved alpha/epi.** Krisl, M.E.; Sachs, I.M. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

New thin film coatings were developed for fused silica, ceria doped glass, and Corning 0211 microsheet which provide increased emissivity and/or decreased solar absorption. Emissivity is enhanced by suppression of the reststrahlen reflectance and solar absorption is reduced by externally reflecting the ultraviolet portion of the solar spectrum. Optical properties of these coatings make them suitable for both solar cell cover and thermal control mirror applications. Measurements indicate equivalent environmental performance to conventional solar cell cover and thermal control mirror products.

29543 (N—86-17839, pp vp) **Cell research and technology workshop.** Hutchby, J. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Four major areas in solar cell research and technology were considered. The areas were: (1) the silicon cell; (2) the GaAs cell; (3) the multibandgap cell; and (4) novel ideas. In each area material research issues, cell research issues, and the cell technology that needs development are considered.

29544 (N—86-17839, pp vp) **Space Environment Workshop.** Horne, W.E. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Various environmental effects were ranked according to their perceived importance. The relative importance of any particular environment component is viewed within the context of the anticipated mission environment. The chart does serve as an indication of the historically major environmental concerns for operating space power systems.

29545 (N—86-17839, pp vp) **Array technology and applications.** Goldsmith, P. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The role of photovoltaics (PV) in advanced missions and its use is discussed. Mission goals were analyzed and advanced concepts were tested. Costs were considered and the viability of the U.S. array industry is examined.

29546 **(ORNL/TM—10018) Photosynthetic water splitting. Annual report, March 1, 1985-February 28, 1986.** Greenbaum, E. (Oak Ridge National Lab., TN (USA)). May 1986. Contract AC05-84OR21400. 27p. (GRI—86/0087). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010269.

This document is an annual report prepared for the Gas Research Institute dealing with two key advances which have been made during the current reporting period. First, net thermodynamic efficiencies of the conversion of light energy into a gaseous fuel via photobiological water splitting have been measured. Based on the Gibbs free energy of hydrogen production by intact microalgae, conversion efficiencies of ~10% have been measured in the linear, low-intensity region of the light saturation curve of photosynthesis. These are, by far, the highest conversion efficiencies reported for photobiological hydrogen production. Success in this measurement was based, in part, on a recognition of the physiological state of the algae with respect to the number of monolayers used for the measurement. Second, a key advance in biotechnology methodology has been made in the area of rapid assay and screening techniques for gaseous fuel synthesis of microalgae. Working with isolated colonies cultured on specially formulated, optically black, solid-growth media, hydrogen production by individual colonies of algae irradiated with an X-Y translatable helium-neon laser has been quantitatively measured. It is believed that this newly developed methodology represents an important instrumentational advance for applying modern techniques of genetics and molecular biology to the problem of gaseous fuel synthesis from renewable inorganic resources via microalgal water splitting. 12 refs., 6 figs., 2 tabs.

29547 **(SNV-PM—1997) Fertilization with peat and wood ashes - effects on biomass production, nutrient balance and uptake of heavy metals.** Bramryd, T. (Lund Univ. (Sweden). Dept. of Plant Ecology). 1984. 84p. (In Swedish). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751681.

Fertilization with peat- and wood ashes was carried out on peatlands in North Scania, South Smaaland, Vaestmanland, and Gaestrikland in Sweden. In addition to Salix plantations experiments were also performed on an agricultural land with barley and potato production outside Kristianstad in northern Scania. Fertilization with 3 kg ashes per m^2 in most cases gave the highest increase in biomass production. Due to frost damages and drought, the lowest production was obtained on peatlands in Vaestmanland and Gaestrikland. In these areas in middle Sweden Salix aquatica has a better survival than Salix viminalis due to a better frost hardiness. Fertilization on a peatland area in Scania with 1 and 3 kg dw per m^2 of sewage sludge gave similar production effects as fertilization with ashes in the same amounts. The increase in productivity was different for different clones of Salix. The highest annual increment was found for Salix viminalis, Salix aquatica, and Salix alba. Barley production increased after ash fertilization with approximately 10-20%. The investigation indicated that the accumulation of heavy metals in the soil and the uptake in plant fractions are less after fertilization with peat ashes than after using wood ashes. The highest uptake of heavy metals was found with 3 kg wood ashes per m^2. These results were found both for Salix, potatoes and barley. As the rootsystems of Salix are fully developed first after three to four years it is essential that the experiments will continue for another period of three or four years in order to receive reliable results. The possibilities to use wood ashes in an environmentally safe way depends mainly on the concentrations of heavy metals in the fuel. Thus painted wood and other types of waste wood with high concentrations of heavy metals should be avoided. 28 refs and 21 tabs.

29548 **Status of photovoltaics R & D at SERI.** Deb, S.K. (Solar Energy Res. Inst., Golden, CO 80401). pp 231-235 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—). Contract AC02-83CH10093.

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

This paper describes five major activities on the solid state photovoltaic research at SERI and these are: (1) fabricaton and characterization of thin film amorphous silicon alloy materials and devices, (2) polycrystalline thin film solar cells such as CdS/$CuInSe_2$, (3) high efficiency multijunction solar cells using Si as the low band gap and GaAs/sub 0.7/P/sub 0.3/ as the high band gap materials and a superlattice interconnect for dislocation filters, (4) synthesis and growth of ternary semiconductors (n and p type) and high purity single crystal silicon grown by float-zone and cold-crucible techniques, (5) theoretical calculations of the electronic structures of impurities in semiconductors, total energy calculations of alloys of binary semiconductors and electronic structures of novel semiconductors.

29549 **Optical effects of thin film adhesives in multijunction solar cells.** Siegel, R.B. (Sandia National Lab., Albuquerque, NM 87185). pp 254-259 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

Multijunction solar cells afford an attractive method of increasing module efficiency. The optical coupling of mechanically stacked cells causes some concern since the gains from the bottom cell can be effectively negated by reflectance losses between the cells. A short outline of the theory of thin film optics as applied to this situation is presented. Theoretical reflectances of single and multiple layer thin films between AlGaAs and Si cells are developed. An option currently being investigated for a series connected multijunction cell is illustrated. The multijunction cell with a multilayer optical coupling could have less than 1% reflectance loss between the cells. This compares most favorably to the ≈25% reflectance loss of thick adhesvie layers, and approaches the reflectance of monolithic systems.

29550 **Thin-film tandem solar cells based on $CuInSe_2$.** Birkmire, R.W.; Phillips, J.E.; Di Netta, L.C.; Meakin, J.D. (Inst. of Energy Conversion, Univ. of Delaware, Newark, DE 19716). pp 270-274 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

A monolithic optically and electrically coupled two junction tandem solar cell has been produced. The component cells are Cd/$CuInSe_2$ and CdS/(CdHg)Te polycrystalline heterojunctions. Devices with over 1.0 volt open circuit voltage and over 6 mA/cm_2 short circuit current have been achieved. It is estimated that an efficiency of over 20% should be practically achievable.

29551 **High efficiency flat-plate module research.** Spitzen, M.B.; Geoffroy, C.M.; Nowlan, M.J. (Spire Corp., Bedford, MA 01730). pp 467-469 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

Recent results on development of a highly efficient flat-plate module are presented. The module comprises densely-packed large-area (53 cm^2) ion-implanted cells that have average AM1.5 efficiency of 15.4%. The cell design includes a back surface reflector that rejects sub-bandgap photons so as to reduce module operating temperature. Module dimensions are 91.2 cm x 54.2 cm and peak power is 66 watts.

29552 **Photoluminescence studies of CuIn-Se_2 thin films and crystals.** Abou-Elfotouh, F.; Kazmerski, L.L.; Cuhen, D.; Noufi, R.; Dunlavy, D.J. (Solar Energy Res. Inst. Golden, Colorado 80401). pp 841-845 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—). Contract AC02-83CH10093.

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

Photoluminescence spectroscopy is utilized to investigate the defect chemistry of Se-deficient $CuInSe_2$ single crystals and polycrystalline thin films. The relationships to composition are reported, and results are categorized into Cu-rich and In-rich cases. Deconvolution is used to determine the energy positions of the various defect transitions which normally overlap in the complex PL spectral. Se-environment heat treatments provide further confirmation of the location of the Se-vacancy level, some 120-130 meV above the valence band edge. Photoluminescence spectra of thin films are reported, with donor/acceptor transitions dominating the In-rich cases. No photoluminescence is observed in Cu-rich polycrystalline thin films.

29553 **EL2 and related defects in GaAs - challenges and pitfalls.** Gatos, H.C.; Lagowski, J. (MIT, Cambridge, MA). pp 15 of Symposium on microscopic identificatio of electronic defects in semiconductors. San Francisco, CA; Materials Research Society (1985). (CONF-850421—).

From 2. spring meeting of the Materials Research Society; San Francisco, CA, USA (15 Apr 1985).

The incorporation process of nonequilibrium vacancies in melt-grown GaAs is strongly complicated by deviations from stoichiometry, and the presence of two sublattices. Many of the microdefects originating in these vacancies and their interactions introduce energy levels (shallow and deep) within the energy gap. The direct identification of the chemical or structural signature of these defects and its direct correlation to their electronic behavior is not generally possible. It is therefore necessary to rely on indirect methods and phenomenological models and be confronted with the associated pitfalls. EL2, a microdefect introducing a deep donor level, has been in the limelight in recent years because it is believed to be responsible for the semi-insulating behavior of undoped GaAs. Although much progress has been made towards understanding its origin and nature, some relevant questions remain unanswered. An attempt is made to assess the present status of understanding of EL2 in the light of the most recent results. 61 references.

29554 **Block V module development and test results.** Smokler, M.I. (Jet Propulsion Lab., California Inst. of Tech.). pp 370-376 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

The Block V solar-cell module development program was conducted by the Flat-Plate Solar Array Project at the Jet Propulsion Laboratory to encourage the introduction of the results of Project research into the design and manufacture of silicon solar-cell modules. Five contractors were engaged in a program of design, manufacture and qualification testing. The resultant designs are characterized by large size, high power output, high efficiency and the application of several design measures that have been shown to increase reliability. Physical features common to all designs include glass superstrates, ethylene vinyl acetate encapsulant, plastic-film back covers, fault-tolerant interconnect and metallization schemes, and parallel circuit strings. The cell technologies include single- crystal, semicrystalline and edge-defined film-fed ribbon. Module qualification test results have shown that some formerly common failure modes have been virtually eliminated by use of project- developed design guidelines, but some other failure modes can still be expected in new designs. Some necessary improvements in electrical performance measurements were accomplished. Three of the five contractors in the program will soon supply modules very similar to those developed for this program for construction of a 1.2 MW segment of a central station power plant.

29555 **Mechanically-stacked multijunction solar cells.** Gee, J.M. (Sandia National Lab., Albuquerque, NM 87185). pp 245-253 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

The results of experiments to simulate the performance of mechanically-stacked, multijunction solar cells are reported. The simulation consisted of stacking an AlGaAs optical filter on top of a silicon cell and measuring the silicon cell's output. Analysis of the experimental results was able to quantify the various mechanisms (absorption and reflection) that resulted in the loss of silicon cell output. Calculations were also performed to compare the relative merits of two different types of silicon cells and an InGaAs cell for stacked cell applications.

29556 **Polycrystalline silicon: Impurity incorporation and passivation.** Kazmerski, L.L. (Solar Energy Research Inst., Golden, CO 80401). pp 83-89 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

The incorporation of selected impurities in Si grain boundaries is investigated using specialized analytical techniques. Specifically, H-diffusion, Al-diffusion and As-segregation mechanisms are studied, and the direct chemical mapping of these impurities on grain boundary planes is presented for the first time. These analyses utilize Volume-Indexed SIMS and AES for the identification of the impurity species, the concentrations and the exact spatial location. The passivation of the intergrain regions by these impurities is discussed.

29557 **Development of laser-processed high-efficiency n+pp+ silicon solar cells.** Ruckteschler, R.; Wood, R.F.; Westbrook, R.D. (Solid State Div., Oak Ridge National Lab., P.O. Box X, Oak Ridge, TN 37831). pp 1006-1010 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—). Contract AC05-84OR21400.

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

The cold processing techniques of glow discharge implantation and excimer laser annealing have been adapted to the fabrication of solar cells from p-type silicon. Efficiencies of 10.8% without an AR coating or surface passivation have been obtained on 1 Ohmcm material using only very simple processing steps. For polycrystalline silicon cold processing showed advantages over conventional diffusion techniques. This was attributed to the preservation of the diffusion length by avoiding high-temperature processing steps.

29558 **Flat-Plate Solar Array Project (FSA) progress and plans.** Callaghum, W.T. (FSA Project, Jet Propulsion Lab., Pasadena, CA). pp 911-915 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

The Flat-Plate Solar Array Project (FSA), sponsored by the U.S. Department of Energy and managed by the Jet Propulsion Laboratory, conducts research on a wide range of photovoltaic module technologies. Significant recent progress in silicon feedstock refinement and cost reduction; ribbon sheet substrate formation, engineering sciences and module testing are presented.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 29456, 29516, 29554

29559 **(DOE/JPL—1012-114) Sensitivity analysis of central station flat-plate photovoltaic systems and implications for National Photovoltaics Program planning.** Crosetti, M.R.; Jackson, B.L.; Aster, R.W. (Jet Propulsion Lab., Pasadena, CA (USA)). 30 Aug 1985. Contract AI01-76ET20356. 64p. (JPL-PUB—85-92). NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86010243.

The purpose of this study is to explore the sensitivity of the National Photovoltaic Research Program goals to changes in individual photovoltaic system parameters. Using the relationship between lifetime cost and system performance parameters, tests were made to see how overall photovoltaic system energy costs are affected by changes in the goals set for module cost and efficiency, system component costs and efficiencies, operation and maintenance costs, and indirect costs. The results are presented in tables and figures for easy reference. An analysis is made of the effects of regional differences in competing energy costs and solar insolation levels on the competitiveness of photovoltaic systems. The sensitivity of competing energy costs (coal, combustion turbine, and combined cycle oil-fired generators) to escalation rates for capital and fuel are explored. Alternative tracking configurations (fixed, one-axis, and two-axis tracking) are also introduced into the sensitivity analysis. Goal values for photovoltaic system parameters were reviewed on the basis of the most recent research findings. Sensitivity tests were made to see how research progress in areas such as power-related balance of system cost affected the combinations of module cost and module efficiency that meet program goals for system energy costs.

29560 (N—86-17839, pp vp) **Future Air Force space power needs.** Wise, J.F. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

The requirements for future power for AF satellite mission vehicles fall into two categories. The first category is in the 1 to 50 kW range for missions of a continuous nature such as communication, navigation, surveillance, data relay and meteorology. The second category is in the multi-megawatt range for either continuous or burst power durations and are for other than solar power sources. Requirements for longer life and survivability in varying degrees are there for all systems. While the power levels do not appear difficult to achieve in view of the large array developments pursued by NASA Space Station technology, the other military requirements are very challenging and continue to be system drivers. The development of solar cells arrays should be in conjunction with other power supply technologies such as regulation and control components and energy storage subsystems. 1 reference.

29561 (N—86-17839, pp vp) **Power requirements for commercial communications spacecraft.** Billerbeck, W.J. 1985. NTIS, PC A13/MF A01. (NASA-CP—2408; E—2706; CONF-8504230—).

From Space photovoltaic research and technology conference: high efficiency, space environment, and array technology; Cleveland, OH, USA (30 Apr 1985).

Historical data on commercial spacecraft power systems are presented and their power requirements for the growth of satellite communications channel usage are related. Some approaches for estimating future power requirements of this class of spacecraft through the year 2000 are proposed. The key technology drivers in satellite power systems are addressed. Several technological trends in such systems are described, focusing on the most useful areas for research and development of major subsystems, including solar arrays, energy storage, and power electronics equipment.

29562 **Photovoltaic array thermal behavior.** Whitaker, C.M.; Wrasman, B.P.; Risser, V.V. (New Mexico Solar Energy Inst.; New Mexico State Univ., Box 3 SOL, Las Cruces, NM 88003). pp 387-391 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

In 1983 the New Mexico Solar Energy Institute (NMSEI) constructed a flexible photovoltaic (PV) testbed as part of the Southwest Region Experiment Station (SWRES) U.S. Department of Energy contract. The flexible testbed (Flex) was designed to test numerous PV system components and configurations without the need for new structures. This paper discusses the initial results from the first series of tests designed to quantify the effects of array mounting, specifically standoff height, on operating temperature

29563 **Cell efficiency and module cost goals to achieve economic photovoltaic central power systems in the United States.** Prince, M.B.; Herwing, L.O. (U.S. Dept. of Energy, 1000 Independence Ave., S.W. Washington, DC). pp 222-225 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

For photovoltaic energy systems to compete in the United States utility electrical energy market, photovoltaic energy systems must be able to produce electricity at or about the same cost as other competing energy systems such as oil, gas, coal, nuclear, etc. PV may be able to command a slightly higher price than some of the other sources because of its safety non-pollution and other benefits. However, this premium should not be counted on. Cost is the main driving force in our society in selecting its energy sources.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 29607, 29609

1408 Ocean Energy Systems

29564 **(UCRL—93207) Stripline insulation design analysis by partial discharge measurements.** Gordon, L.B.; Wilson, M.J.; Grasz, E.L.; Cooke, C.M. (Lawrence Livermore National Lab., CA (USA); Massachusetts Inst. of Tech., Cambridge (USA). High Voltage Research Lab.). 3 Mar 1986. Contract W-7405-ENG-48. 6p. (CONF-860384—7). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009717.

From Conference on measurement of electrical quantities in pulse power systems-II; Gaithersburg, MD, USA (5 Mar 1986).

Partial discharge measurement techniques are being used to analyze the design and performance of components in fast pulsed systems. A stripline geometry was chosen for study to represent typical pulse power structures since it contains regions where the insulation must sustain nonuniform fields as well as uniform fields. Electric field modeling and gas breakdown theories are used to predict the location and voltage inception level of the partial discharges. A multichannel pulse height counting system, coupled with sensitive detection circuits, is used in a noise-free environment to measure picocoulomb discharges. Inception level and signatures are observed for several geometries and change in the signature is correlated with dielectric aging. Rapid changes in the partial discharge signature occur just prior to component failure.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 29514, 30005, 30006, 30007, 30008, 30009, 30010, 30013

29565 **(DOE/SF/11918—T2) Solar Heat Technologies international program coordination support. Final report.** (TPI, Inc., Bethesda, MD (USA)). Oct 1985. Contract AC03-83SF11918. 15p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010134.

The US Department of Energy's Office of Solar Heat Technologies participates in a number of international cooperative R and D agreements intended to advance solar heating and cooling technology. Support for the coordination of these international solar projects has been provided through TPI, Inc. which concluded on September 30, 1985. The support was provided by TPI, Inc. for the period October 1, 1983 to January 31, 1984 and, through a subcontract, by International Planning Associates for the period February 1, 1984 to September 30, 1985. This report summarizes the activities performed under this subcontract. However, it should be noted that because of the nature of the support work, this report is essentially a summary of the monthly status reports submitted over the contract duration.

29566 **(ETSU-R—25) Active solar heating in the UK. Department of Energy R and D programme 1977-1984.** Alper, B.; Forrest, R.A.; Long, G. (UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.). 1985. 245p. H.M. Stationery Office, London, price Pound 15.

A report is given of the UK Department of Energy R and D programme on Active Solar Heating in the UK during the period 1977-84. The technical areas of water heating, space heating and thermal storage are analysed and the results of various field trials are reported. From this information, likely performance and costs are assessed for active solar heating devices and the economic prospects are assessed. (U.K.).

29567 (MRI/SOL—1901, pp 1-22) **Solar-powered, fuel-assisted Rankine cycle and cooling system: King Abdulaziz University cooling project.** Gari, H.; Khalifa, A.; Ghazi, M.; Radhwan, A.; Mannaa, A. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

A solar-powered fuel-assisted steam Rankine cycle (SPFASRC) that produces 36 kW steady electrical power and operates a 22-ton central air cooling system is described. The size of the cooling system chosen represents the size of an air-conditioning system used for a typical single-family residential dwelling in Saudi Arabia. Steam is generated at 230°C by the use of 400 m^2 of concentrating parabolic trough collectors and then superheated to 400°C in a natural gas-fired superheater. The Rankine cycle features a two-stage turbine. At design conditions the steam Rankine cycle's efficiency is computed at 23.2%. A computer program was developed to determine the optimum design conditions and to simulate the system's performance under design and off-design conditions. The results of the simulation indicate that the size of the solar collector chosen provides from 80 to 85% of the total energy required for the Rankine cycle during the summer, fall, and spring seasons. In the winter season, however, about 70% of the total energy is supplied by solar energy. The design of SPFASRC and its seasonal performance for Jeddah's climate are described.

29568 (MRI/SOL—1901, pp 23-34) **Integration of passive and active solar strategies in buildings.** Wilcox, B.A.; Barnaby, C.S.; Huizenga, C.A. (Berkeley Solar Group, CA). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Integration of passive and active strategies for building space conditioning causes alterations in the load patterns on the active system which tend to reduce active system performance. A detailed analysis of the effect of a passive solar system on the heating and cooling loads of a residence in Albuquerque, New Mexico, USA, is presented.

29569 (MRI/SOL—1901, pp 35-58) **Flow in the circulation loop of a thermosyphon solar water heating system.** Abu-Abdou, K. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

By its nature the flow of energy-carrying fluid in solar water heating systems working in the thermosyphon mode is unsteady, and it has accordingly non-zero time derivative in general. It is often assumed that this flow is quasi-steady where the time derivative can be neglected. To alleviate this a more rigorous derivation of the equation of motion is presented and the effect of the time derivative is discussed. How the flow accelerates to higher or decelerates to lower flow rates is described. Again, the often assumed linear temperature distribution in the storage tank is considered together with another case, namely uniform tank temperature which occurs if good mixing is present. A further extension is introduced by allowing useful energy transport from the tank as described by an increased heat transfer co-efficient from the tank to the ambient atmosphere. Appreciable changes in the system characteristics occur due to this energy transport. After a brief discussion of different experimental methods to measure the low flow rates in the thermosyphon system, a simple method is suggested which does not add further resistance to the flow in the loop and does not use any sophisticated equipment.

29570 (MRI/SOL—1901, pp 59-76) **Solar thermoelectric cooling system.** Sofrata, H. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

In remote areas, where the electric grid is not available, thermoelectric cooling (Peltier effect) is one of the best candidates for building cooling and food refrigeration. Since such a system requires direct current supply, it is perfectly matched with solar photovoltaic electric power generators. Different from all other cooling systems, the thermoelectric cooling does not require any compressor, expansion valves, absorbers, condensers or solution pumps. Moreover, it does not require working fluids or the utilization of any moving parts. It simply uses electrons rather than refrigerant as a heat carrier. The proposed system will utilize the commercially available thermoelectric modules from different USA producers to a novel construction to suit this type of application. Air cooled heat rejection, natural water cooling, forced and free convection devices shall be tested and optimized in order to find the best design. A computer system to predict the modules' behavior has been developed. Also, experimental photovoltaic collectors have been modified to work on low voltage in order to evaluate the optimum working voltage for such thermoelectric applications.

29571 (MRI/SOL—1901, pp 77-87) **Performance and cost experience of active solar-heated buildings.** Williams, J.R. (California State Univ., Long Beach). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

During the past decade, a large number of active solar heated homes and buildings have been constructed. Many of these systems have functioned well, providing reliable, economically competitive heating for the buildings. Unfortunately, however, many others have malfunctioned or operated below the level of expectation of the building owner. During the past two years, much has been learned from the mistakes that were made on these projects and this knowledge should help the industry to install higher quality systems in the future. It is clear that, in most parts of the world where heating is required, solar energy is a practical, economical alternative to conventional energy forms, and that solar energy systems can be installed which are efficient, reliable, and durable.

29572 (MRI/SOL—1901, pp 89-120) **Simulation and optimization of design parameters of solar-operated absorption cooling machine.** Elsayed, M.M.; Taha, I.S.; Darwish, M.A. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

An analysis of a solar-operated absorption cooling system is carried out for both water-lithium bromide and aqua-ammonia systems. The design parameters of the machine are derived and found to consist of: (1) values of the mass flow rates of the solution at exit from the absorber, of heating medium from solar collector to generator, of cooling fluid to absorber and condenser, of circulating fluid through the evaporator; (2) values of temperatures of solar heated fluid to generator, of cooling fluid to absorber and condenser, and of chilled water or circulated air to the evaporator; (3) concentration of the solution at the exit from the absorber; and (4) the product of overall heat transfer coefficient and the heat transfer surface area (UA) of the different components of the absorption machine. These design parameters, except UA's, are determined from thermodynamics and engineering considerations of the circumstances under which the machine is to be operated. In order to carry out the optimization for the values of UA's, a performance of the absorption machine has to be predicted for different sets of values. The prediction of the performance is achieved by solving a set of non-linear algebraic equations which simulates and governs the performance of the machine. The Hooke and Jeeves pattern search technique is used for both solving the governing equations and carrying out the optimization for the UA's. Results are carried out for the water-lithium bromide machine for two sets of operating parameters and for a wide range of the cost coefficient.

29573 (MRI/SOL—1901, pp 121-141) **Performance and economic assessment of state-of-the-art solar cooling systems.** Karaki, S. (Colorado State Univ., Fort Collins). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

During the past ten years of research and development (R & D) in solar equipment for space cooling, a number of interesting concepts have been proposed and examined. While some have appeared as working components and systems, many others have not materialized as practical hardware. Although solar cooling appears attractive on a technical basis, it is fair to say that commercial adventures with solar cooling systems has been tentative. Only a very small portion of the total numbers of solar systems installed and operating in the USA are solar cooling systems or include solar-related cooling capabilities. Nevertheless, there are a few operating systems in commercial application and in R & D laboratories, and it is instructive to examine the performance of those systems over a period of the past few years. Although there are many types and varieties of conceptual and theoretically interesting solar cooling systems, discussion of performance is confined to systems for which there are substantial system performance data. This limits the types of systems to solar-powered closed cycle absorption cooling and heat-engine-driven vapor-compression cooling systems.

29574 (MRI/SOL—1901, pp 143-162) **Passive solar cooling house at King Faisal University.** Bajwa, M.M.; Galea, J.M.; Aksugur, E.; Al-Otaibi, G.S. (King Faisal Univ., Dammam, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The work done to date on the K.F.U. Solar House is outlined. The project forms part of a wider research program sponsored by SOLERAS, a joint Saudi-American venture. After defining the project objectives and briefly reviewing the traditional methods of dealing with climate in the Dammam area, the research methodology adopted is outlined. Decisions on the basic socio-cultural design parameters followed are then specified. After a critical presentation of climatic data, the analysis leading to general design guidelines regarding overall proportions, orientation, form, etc., as well as the determination of the viability of a variety of passive cooling techniques, is described. This is followed by a review of four design concepts incorporating selected techniques. The results of a comparative study of the different concepts using a thermal simulation model are given. The report ends with a description of the final revised and developed version of the house which is expected to be constructed at the K.F.U. campus and monitored for its thermal response.

29575 (MRI/SOL—1901, pp 163-176) **Overview of US solar building research.** Williamson, J.S. (Midwest Research Institute, Kansas City, MO). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Active solar systems are under development to displace fossil fuels for energy for building space conditioning and hot water heating energy consumption. In the US, the annual energy consumption for buildings represents nearly one-third of the nation's total energy requirements. The US Department of Energy plans for research and development to establish viability and readiness for the commercial market of active solar heating and cooling are summarized. The goal is to provide a technological base for contribution of a significant share of energy supplies for building applications.

29576 (MRI/SOL—1901, pp 177-204) **Solar-powered dual cycle absorption cooling system.** Sofrata, H. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

In the King Saud University, SOLERAS Program activity, the dual absorption cycle has been introduced for the first time as a solar building cooling system. That cycle has the advantages of being able to be powered by solar energy and also avoids the use of a wet cooling tower which consumes considerable quantities of water. The latest theoretical and experimental research results are presented. In the theoretical part, the thermodynamic bases for the dual cycle, expressed in terms of the Carnot and Lorenz ideal cycles, are examined and optimized for various operating conditions. These ideal cycles are compared with the standard cycle, based on lithium bromide-water PTX diagram. Also, the required assumption for both cycles is considered. In the experimental part, the final configuration of the system is described. This selected configuration considers the completely thermally operated (no pump or any other mechanical power needed) Yazaki absorption unit as the low temperature level cycle, while the Arkla and Sanyo (pump-operated) units will be locally modified to act as the high temperature level cycle. This new and final configuration is discussed showing the role of the solar thermal collector energy supply.

29577 (MRI/SOL—1901, pp 205-216) **UPM solar cooling project.** Nazer, M. (Univ. of Petroleum and Minerals, Dhahran, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

In December 1981, the University of Petroleum and Minerals signed an agreement with the Joint US/Saudi Arabian Program for Cooperation in the Field of Solar Energy (SOLERAS), under which the University is made responsible for the design, construction, and evaluation of a 7.5-ton solar-assisted, air-cooled Rankine-cycle air-conditioning system to be used to air-condition an existing building. The system has been designed, installed and is undergoing start-up and early testing. A brief description of the major system components and preliminary results of the early testing are presented.

29578 (MRI/SOL—1901, pp 217-232) **Influence of orientation on the internal thermal environment of residential buildings in Riyadh.** Saeed, S.A.R. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

One of the main effects of orientation of buildings is its regulation of the influence of solar radiation and its heating effect on

walls facing different directions. As a general observation from the Gulf States many architects and designers, depending on the availability of cheap energy, tend to overlook the influence of orientation and hence ignore the considerable effect of solar radiation on thermal performance of buildings. As a result, most buildings require large quantities of energy for cooling during summer and heating during winter. An experimental study to investigate the effect of solar radiation on thermal performance of residential buildings in the hot-dry region of Saudi Arabia is described. In some case studies from Riyadh, indoor air temperature and internal surface temperatures of walls and ceilings of fifteen apartments similar in design, construction techniques, building materials, external color, site and location were recorded at 30-minute intervals using four sets of automatic digital thermometers. Temperature recording took place when no air-conditioning was used for a reasonable period of time to insure the natural thermal behavior. It is hoped that the result analysis, findings and conclusion shall be beneficial to architects and designers, especially those practicing in the region.

29579 (MRI/SOL—1901, pp 233-246) **Studies of froosh, the thermoregulating indigenous construction material of the Saudi Arabian Gulf Coast.** Ullah, M.B. (Univ. of Petroleum and Minerals, Dhahran, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Indigenous building materials play an important role in the development of form in vernacular architecture which being in perfect harmony with the people and the climate of the place render the indoor environment of the building comfortable. The common building material in the traditional buildings in the Eastern Province of Saudi Arabia has been shallow sea-bed seashell calcified sedimentary rock, commonly called froosh. However, the traditional architecture of a place as a whole entity should be analyzed with respect to the total perspective in which the climate, the craftsmanship of the builder, and the material all play important roles. Once froosh was the most common building material in the construction of buildings in the populous oasis of Qatif. This material is still available in large quantities in an area of the Gulf called Al-Zabna and Al-Jazeerah about twenty kilometers south of Dammam. The use of froosh in the construction of traditional houses is discussed.

29580 (MRI/SOL—1901, pp 247-274) **Desirable orientation and proportion of courtyards for Riyadh region.** Hemeid, A.A. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Responding to high intensity of solar radiation and dusty hot winds compact buildings and narrow shaded street patterns evolved in the cities of hot and arid climatic regions. Such developments are characterized by minimum-surface external walls limited to the entrance side of the buildings, mostly facing a narrow shaded street. Relationship between the interiors of the buildings and the sky is established through courtyards. Windows of the rooms are located on such courtyards and the occupants of the houses use them as their outdoor living spaces. The goal of this study is to find a desirable combination of courtyard proportion and orientation for optimization of their effectiveness.

29581 (MRI/SOL—1901, pp 275-288) **Solar architecture since 1970: passive and low energy innovations.** Cook, J. (Arizona State Univ., Tempe). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Solar architecture in the US since 1970 is reviewed to identify the distinct innovations contributed especially by passive and low energy concepts. The more conventional applications of active solar systems are characterized when architecturally integrated as either planar or flakey following earlier prototypes. However, the popularization of passive solar heating first in the remote colder parts of New Mexico are characterized by architectural innovation in many architectural styles, which are associated with significant shifts in the energy and life style goals of building. The inherent need for auxiliary heating has automatically integrated controls and other energy systems. Simultaneously it has provided the transition to passive cooling and to the entire range of building types, scales and climates. Thus, solar applications appear to have gradually affected the mainstream of architectural design especially in the conceptualization of all energy forms.

29582 (MRI/SOL—1901, pp 289-308) **Passive solar heating and analysis.** Jones, R.W. (Los Alamos National Lab., NM). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Passive solar heating experience and analysis techniques are reviewed with emphasis on annual auxiliary heat requirement. The role of analysis in the design of passive solar buildings is discussed. Selected results for existing systems are presented for locations in Saudi Arabia and climatically similar locations in the US. Advanced systems in the research stage are described.

29583 (MRI/SOL—1901, pp 309-317) **Solar energy policies and the role of human settlements planner.** Durrani, T.M. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

It is always gratifying to see the results of one's efforts being utilized to the benefit of our societies, especially the target groups. In the context of the topics of this workshop on solar buildings, the ultimate user of the research is going to be, by and large, the private home owner - whether he is building a new residence or retrofitting an existing one with a new solar system. Public policies and the public sector can, no doubt, play a very significant role in promoting the utilization of the relevant research. Human settlement planners, active in both urban and rural environments, have an important intermediary role to play in implementing the public policies in both the public and private sectors. Their training and professional roles at various levels of government and corporate decision making process put them at a particularly useful point. An effective utilization of the results of the research on solar energy by a home owner would, however, rely on a host of factors ranging from his general awareness of the problem to his final decisions concerning adoption or rejection of a particular (design) alternative. Some of these factors (major variables and intervening variables) are discussed in the context of certain models of communication of innovations, especially the diffusion-adoption processes, and the role a planner might play in these processes.

29584 (MRI/SOL—1901, pp 319-339) **Passive-hybrid cooling and load avoidance in very hot climates.** Clark, E.E. (Trinity Univ., San Antonio, TX). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Passive, hybrid and active cooling system characteristics are contrasted. Passive and hybrid comfort cooling systems are described as beginning at the surface of the human body. Current comfort literature is surveyed with an emphasis on the benefits of ceiling fans. A high-temperature-comfort strategy is defined which depends on air motion. The heat load suppression benefits of this strategy are described. Climate data for selected very hot cities are listed. A variety of sensible and latent cooling load suppression measures are surveyed briefly. Simulations show that residential cooling energy requirements can be small even in Phoenix in a very energy conserving conventional residence. Passive and hybrid cooling system performance in very hot climates is assessed briefly. Ground coupling can be an important source of cooling if the surface temperature is controlled. Radiative cooling is important, but not sufficient for comfort. Indirect evaporative cooling systems can provide comfort in very hot climates and can be combined with radiative cooling for water conservation. Evaporative systems can utilize brine and offer opportunities for efficient condensation of fresh water.

29585 (MRI/SOL—1901, pp 341-394) **Bioclimatic indicators for determining passive and low energy hybrid systems - case study, Saudi Arabia.** Bowen, A. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Contrary to general belief, the Kingdom of Saudi Arabia experiences several distinctly different climates. Glenn's classification based on the Koppen system establishes three climate regimes. Based upon existing meteorological information (found to be uneven, not contiguous, and occasionally erroneous), nine distinctly different bioclimatic regions have been determined, both seasonally and diurnally. Bioclimatic charts for 13 locations have been plotted for analysis and justification of the nine suggested regions. Planning and design indicators are given for Jeddah, Riyadh, Jizan, and Dammam.

29586 (MRI/SOL—1901, pp 395-407) **Overview of environmental design methodologies and problems related to passive low energy architecture.** Siddiqi, A.A. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Vernacular architecture laid great emphasis on the quality of physical as well as psychological environment in built spaces for human use. Unfortunately, contemporary modern architecture fell prey to the invention of machines and mass production of increasingly similar designs divorced from the environment that surrounds them. The post-water period saw unprecedented building activity, and discovery of oil and abundance of other fuel sources gave way to extravagant designs which paid little regard to the energy consumption. It was not until the oil crisis in the early 1970's that policy makers and designers recognized the real need for energy conservation and partly resorted to the lessons of the past in shaping man's environment. There, however, had been a continued effort in terms of investigations and systematic evaluation of the built environment in order to identify issues of major concern to designers. This study attempts to identify those efforts and the directions given by them for future environmental designers. Emphasis has been laid on identification of case studies related to design of built spaces with particular reference to thermal environment. Work done in the field of solar energy related to architecture and buildings has been highlighted. Critical evaluation of work done in these fields has been used to further these investigations and lay down a future course for designers. Examples are cited from different parts of the world with particular reference to tropical hot arid regions typical of Muslim countries.

29587 (MRI/SOL—1901, pp 575-583) **Solar collectors for building applications.** de Winter, F. (Atlas Corp., Santa Cruz, CA). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The flat plate liquid heating collector, the most likely collector for most building applications, has been in use for about one century. Detailed understanding of its performance started with a paper in 1942, but at present seems well under control, and is described in many texts and publications. Less widely appreciated are probably many design and operation idiosyncrasies which can often spell the difference between success and failure. A number of such concerns are presented, in the hope that others attending the meeting will add to the list.

29588 (MRI/SOL—1901, pp 585-595) **Simulation of a two-stage solar-operated absorption cooling system.** Elsayed, M.M. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

A mathematical simulation of a two-stage, solar operated absorption refrigeration system is described. The system is fully defined in terms of 26 state points, 18 of which belong to the internal fluids and the other 8 are for external fluids. The system performance is expressed in terms of 55 equations. The design parameters are identified and found to be 21 parameters. The criteria to select these design parameters and the design range of each parameters were discussed. A procedure to predict the performance of the system under wide ranges of design and operating conditions are suggested.

29589 (MRI/SOL—1901, pp 597-613) **Energy conservation and its implication for architectural design and town planning in the hot-arid areas of Saudi Arabia and the US Gulf States.** Khair-El-Din, A.E.H.M. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The energy crisis has had adverse effects on the national development plans of Saudi Arabia and the US Gulf states, even though they are oil-rich countries. Sooner or later fossil fuels will be in short-supply. The whole of the energy needs is examined with a view to reducing the demand for oil and making better use of solar energy. A better understanding of the climatic conditions and the use of passive solar energy in building techniques by simply grouping buildings better would save energy. Research into building materials with a higher thermal capacity and insulation value, that are durable and maintenance free, is needed. Towns and communities should be laid out so that travel requirements are reduced to a minimum. Transport modes should be suitable and efficient. Hopefully, a pleasant living environment can be created for the peoples of the Arabian Gulf despite the harshness of the climate while at the same time conserving their national health.

29590 (MRI/SOL—1901, pp 615-634) **Daily thermal storage for heating and cooling of buildings.** Saleh, M.A.E. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Daily thermal storage for heating and cooling is discussed for three different built-in storage systems in three locations. It is apparent that the large thermal mass of the structure decreases the magnitudes of the heat loss variations. Structural elements like massive masonry walls, adobe walls, massive concrete structures, and water drum walls or roofs have been successfully used for thermal storage at low cost and with high thermal efficiency. The performance of the three thermal storage techniques is assessed and evaluated by instrumentation, monitoring, and computer simulation. Validated mathematical models to represent the real physical models by substituting for the burden of instrumentation and monitoring are also discussed.

29591 (MRI/SOL—1901, pp 635-651) **Cookers for solar homes.** Khalifa, A.M.A.; Akyurt, M.; Taha, M.M.A. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Means were investigated for piping solar energy into the kitchen. Two different solar cookers utilizing the heat pipe principle were designed, constructed, and tested. A cooker utilizing an east-west line focusing collector, designated Mecca-1, was developed for this purpose. The second cooker was a flat plate heat pipe cooker, Mecca-2. A single heat pipe in each cooker absorbed the energy at the collector, transported it isothermally into the kitchen, and delivered it to an insulated oven at the condenser end. Various heating and boiling experiments conducted on the two cookers demonstrated the feasibility of the concept. It was found that the Mecca-2 cooker with triple glazing had a utilization efficiency of up to 19% and could boil one liter of water in 27 minutes for a solar insolation of 900 W/m^2.

29592 (MRI/SOL—1901, pp 653-677) **Solar water heating - recent trends, cost, and performance.** Kreider, J.F. (JFK and Associates, Boulder, CO). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The current trends in solar water heating in both residential and commercial sectors are summarized. The new approaches to water heating have been developed in order to reduce cost, improve performance and enhance reliability. It is shown that considerable improvement in performance can be realized but that concomitant cost reductions in the US have not been in the residential sector. Performance measurements and new, simplified prediction methods are presented in the paper. The cost and performance of several significant water heating systems are also presented.

29593 (MRI/SOL—1901, pp 703-714) **Evaluation of SOLERAS solar cooling applications: a building case study and findings.** Hannifan, M.; Martin, R.; Williamson, J. (Midwest Research Institute, Kansas City, MO). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The objective of the SOLERAS Solar Cooling Engineering Field Tests has been to bring solar cooling technologies one step closer to commercialization, competitive with conventional cooling systems. To further this objective, improvement modifications were made to systems developed under the US National Solar Cooling Program, advancing overall system performance of active solar cooling systems while reducing system design, installation, and maintenance costs. The SOLERAS active solar cooling systems were designed to supplement the conventional cooling systems of existing buildings in Phoenix, Arizona with the intent to maximize the use of the solar cooling systems as much as feasible. The varying building thermal characteristics and operating conditions of the selected SOLERAS sites required varying solar cooling strategies to maximize solar utilization and contribution. One of four SOLERAS solar cooling systems is described, with emphasis on the methods used by the SOLERAS contractor to select system components and predict expected operational performance. Actual operational results of three SOLERAS collector field designs are also reported. Additionally, a case study was investigated to demonstrate the integration of advanced active solar cooling systems with more current building design conditions.

29594 (MRI/SOL—1901, pp 715-730) **Passive solar design for a high rise housing building in a seismic zone: design development and calculated performance.** Basso, M.; de Rosa, C.; Gibert, A.; Lelio, G.; Solanes, F.; Vilaprino, R.; Magistocchi, L.; Corbella, O. (Argentine Research Institute on Arid Zones, Mendoza, Argentina). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Highly seismic zones impose specific conditions on the design of high-rise buildings in order to meet reasonable structural costs. When, at the same time, passive solar design is considered, a different set of requirements weighs upon the resulting design and its thermal performance. The work presented attempts to demonstrate that it is possible to obtain acceptable efficiencies of solar heating for high-rise housing buildings with structurally adequate shapes different from a slab-type facing north. The scheme developed, its further adjustment, and their calculated performances prove that satisfactory thermal and energetic results can be achieved for such non-typical solar buildings.

29595 (MRI/SOL—1901, pp 731-743) **Thermodynamic properties state equations of pure methanol and methanol-LiBr . $ZnBr_2$ solutions used in vapor absorption refrigeration and air-conditioning cycle.** Gadhi, S.M.B.; Agarwal, R.S.; Kaushik, S.C. (India Institute of Technology, New Delhi). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The thermodynamic properties state equations for vapor pressure and enthalpy of pure methanol and methanol-LiBr-$ZnBr_2$ mixtures are presented. Constants, range of validity, and RMS errors for these equations are also mentioned. These properties state equations can be used easily and quickly for computer analysis of vapor absorption refrigeration and air-conditioning cycle of alcohol-salt mixtures which was recently reported as an alternative solution for absorption refrigeration systems.

29596 (MRI/SOL—1901, pp 745-754) **Passive cooling in Mexico, Mexico City.** Hernandez, E.; Martinez, R. (Universidad Nacional Autonoma de Mexico). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Several passive cooling experiments that are being carried out at the present time in Mexico are discussed. Due to the diversity of climates in the country, several test facilities and prototypes have been designed for hot-dry, hot-humid, and temperate regions. A description of the main features of the cooling experiments that are carried out in the places involved is presented.

29597 (MRI/SOL—1901, pp 755-781) **Advanced absorption solar air-conditioning systems: thermal modeling and design aspects.** Kaushik, S.C. (Indian Institute of Technology, New Delhi). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

An overview of a research project (TERI-PO84) sponsored by Tata Energy Research Institute (India) is presented. Some new thermodynamic absorption cycles are proposed and analyzed to assess their feasibility for solar space conditioning. Thermal modeling and design aspects of these advanced absorption cycles (viz. dual mode and double effect generation cycles) are presented in particular. Further research work in progress in this project is also mentioned.

29598 (MRI/SOL—1901, pp 783-790) **Use of geoclimatic data for the determination of building characteristics in the north of the Venezuelan Republic.** Mayer, E. (Univ. Simom Boliva, La Guaira, Venezuela). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

A set of sketch design recommendations for the development of bioclimatic constructions was prepared using the geoclimatic data available in north Venezuela.

29599 (MRI/SOL—1901, pp 805-821) **Jordan's first solar-heated house.** Taani, R.; El-Mulki, H.; Kabariti, M.; Batarseh, S. (Solar Energy Research Center, Amman, Jordan). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The results of the Research and Development (R & D) carried out on a Jordanian solar house are presented. A joint R & D project to investigate the possibilities of using solar energy for space heating in Jordan and for space cooling in Kuwait is discussed. A solar house was built in Amman (latitude 32° 01', longitude 35° 33', elevation 980 m), where both passive and active design criteria were considered by the designer of this house. The house has two sections, the living space (65 m^2) and the mechanical room (45 m^2). The overall loss coefficient (U x area) was estimated to be 258 W/C. Two heating systems were investigated in the framework of this project: the underfloor heating system, which was investigated through the winter 1982/1983, and the fan coil unit system, which is currently under investigation. The solar water-space heating system consists of 40 m^2 of locally made flat plate collectors, 2.5 m^3 storage tank, auxiliary oil-fired burner and the necessary piping and control equipment. The results show that the collectors' integrated efficiency was measured as 22.67%, the heat load is considerably high and the share of solar energy to the total load requirements was 22%. Measures were considered to decrease the heating load and to increase the solar system efficiency.

29600 (NBSIR—86-3346) Initial test results and test plan for differential temperature controllers used in solar energy systems. Greenberg, J. (National Bureau of Standards, Washington, DC (USA). Center for Building Technology). Apr 1986. Contract AI01-76PR06010. 144p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE86010215.

The initial test results and procedures used to conduct tests on differential temperature controllers used on solar energy systems are discussed. These tests were performed on generally non-adjustable, non-display units and include the following functional tests conducted at abient conditions: delta T "on" and "off"; recirculating freeze protection with and without auxiliary sensor; controller repsonse to sensor sensitivity; storage high temperature limit; and pump "off" below 80°C. Controller sensitivity to line voltage variation tests were also conducted at ambient conditions and include: delta T "on" and "off" and recirculating freeze protection. The controller test fixture is also described along with the recommended use of decade resistance boxes to simulate thermistor inputs. An overall test plan is also included as a appendix to the report.

29601 (PNL—5629) Value of solar thermal industrial process heat. Brown, D.R.; Fassbender, L.L.; Chockie, A.D. (Pacific Northwest Labs., Richland, WA (USA)). Mar 1986. Contract AC06-76RL01830. 153p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE86009732.

This study estimated the value of solar thermal-generated industrial process heat (IPH) as a function of process heat temperature. The value of solar thermal energy is equal to the cost of producing energy from conventional fuels and equipment if the energy produced from either source provides an equal level of service. This requirement put the focus of this study on defining and characterizing conventional process heat equipment and fuels. Costs (values) were estimated for 17 different design points representing different combinations of conventional technologies, temperatures, and fuels. Costs were first estimated for median or representative conditions at each design point. The cost impact of capacity factor, efficiency, fuel escalation rate, and regional fuel price differences were then evaluated by varying each of these factors within credible ranges.

29602 (SERI/TP—250-2933) Design tools for passive solar applications. Balcomb, J.D. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1986. Contract AC02-83CH10093. 8p. (CONF-860655—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86004447.

From American Solar Energy Society annual meeting and 11. national passive solar conference; Boulder, CO, USA (8 Jun 1986).

Examples of passive solar design tools are given, categorized as either evaluation tools or guidance tools. A trend toward microcomputer-based tools is noted; however, these are usually developed for use by engineers rather than architects. The need for more instructive tools targeted specifically to designers is emphasized.

29603 (SERI/TP—252-2919) Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests. Maclaine-cross, I.L.; Pesaran, A.A. (Solar Energy Research Inst., Golden, CO (USA); New South Wales Univ., Kensington (Australia)). Apr 1986. Contract AC02-83CH10093. 13p. (CONF-860612—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE86004444.

From 4. AIAA/ASME thermophysics and heat transfer conference; Boston, MA, USA (2 Jun 1986).

Adiabatic step transient data were obtained for two dehumidifier test matrices using parallel plates with crushed silica gel and staggered parallel strips coated with microbead silica gel. The data were analyzed using the statistical moments method and combined heat and mass transfer analogy theory. The analysis showed that the average overall Nusselt number in both matrices was about 40% to 50% lower than laminar flow predictions. The average overall Nusselt number for the microbead staggered matrix was about 85% larger than that of the crushed silica-gel parallel-plate matrix. The Nusselt number/friction factor Reynolds number ratio (Nu/fRe) of the microbead, staggered parallel-strip matrix was about 28% larger than that of the crushed silica-gel parallel-plate matrix. These results were explained by introducing a stagnant gas film. The results showed that compact, high-performance, rotary dehumidifiers for desiccant cooling systems are possible and economical.

29604 (SERI/TR—252-2704) Silica gel sorption properties under adiabatic conditions. Pesaran, A.A.; Choudhury, K. (Solar Energy Research Inst., Golden, CO (USA)). Feb 1986. Contract AC02-83CH10093. 61p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86004439.

The SERI Sorption Test Facility was modified from isothermal operation to adiabatic operating conditions so that we could measure the adsorption/desorption characteristics of silica-gel-coated, parallel-channel geometry as a function of operating conditions and aspect ratio under adiabatic conditions. We performed single-blow experiments on two single-passage test cells with different aspect ratios, air flow rates, and inlet conditions. Both adsorption and desorption runs were performed. As the air flow rate and aspect ratio increase when other parameters are kept constant, the desiccant matrix loses its sorption capacity faster. The test cell operated near isothermal conditions rather than adiabatically because the cell walls had a large thermal mass compared with the amount of desiccant used. Since constructing single-passage test cells with small thermal masses that can be operated adiabatically at the Sorption Test Facility is difficult, further testing at this facility will be primarily for isothermal operation. The adiabatic experiments can best be done with multipassage test cells having small thermal masses relative to desiccant mass. A single-blow test facility for performing experiments with multipassage test cells was fabricated in FY 1984, and experiments were performed in an FY 1985 desiccant project.

29605 (WAOENG—85-49) Washington State Solar Bank Program. A comprehensive 1984-85 program evaluation. Spinney, P. (Washington State Energy Office, Olympia (USA)). Nov 1985. 47p. Washington State Energy Office, 400 East Union, Olympia, WA 98504. File Number TI86901217.

The Washington State Solar Bank Program, begun in spring of 1984, offers grants to individuals for passive solar space heat construction in new or existing 1 to 4 unit residential structures. The program is funded through the federal Department of Housing and Urban Development, and is officially titled the Solar Energy and Energy Conservation Bank. Nationally, a number of technologies and program types are funded, including solar water heating and low-income weatherization. The grants for Washington's program are set up to reduce or "write down" the principal on loans to cover project construction costs. The subsidy can cover up to half of total project costs, with a ceiling of $5,000 for single family residences, $7,500 for duplexes, and $10,000 for 3 or 4 unit dwellings. This Solar Bank Evaluation is intended to help decision-makers: (1) know how well the program design worked; (2) understand where improvements could be made in terms of program implementation; (3) gauge the impacts of the program, both those relating to the development of passive solar as a viable technology, and actual displacement of conventional energy sources; and (4) make more informed decisions as to what type of future program should be fielded, should funds become available to do so. The evaluation is based on a variety of data sources, including surveys of participating homeowners, engineers and architects, and contractors; interviews with program staff, the Solar Bank data tracking system, and a simple employment creation model.

29606 (WAOENG—86-03) Washington State Solar Bank Program. Special report: interim evaluation of the solar bank program. Mackey, L. (Washington State Energy Office, Olympia (USA)). Jun 1985. 35p. WSEO, 400 East Union, Olympia, WA 98504. File Number TI86901216.

An interim evaluation of the Washington State Solar Bank program is presented. To complete this evaluation it was necessary to analyze two separate information sources: the Solar Bank data base and the program participants. In order to analyze the latter, a survey was given to 25 participants from which we hoped to learn how well the Solar Bank program was fulfilling its goals, how the participants made decisions in the design and construction of their solar projects and what changes might be necessary for continued program success.

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 29542, 29587

29607 (SAND—85-7007) Parabolic dish module experiment. Final test report. (Sanders Associates, Inc., Nashua, NH (USA). Defense and Information Systems Div.). Mar 1986. Contract AC04-76DP00789. 206p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE86009819.

A development test model of the 8-meter Solar Brayton Parabolic Dish Module has been designed, fabricated, and tested. The test model consists of five major subsystems: Sanders ceramic honeycomb solar receiver; LaJet LEC460 solar concentrator; AiResearch SABC MKIIIA engine, Abacus 8 kW ac inverter; and a Sanders designed and built system controller. Goals of the tests were to integrate subsystem components into a working module, demonstrate the concept, and generate 5 kWe (hybrid) and 4.7 kWe (solar only) input. All subsystem integration goals were successfully achieved, but system performance efficiency was lower than expected. Contributing causes of the lower performance efficiencies have been identified. Modifications needed to restore performance to the required levels and improve the system life cycle cost have been addressed and are the subject of this final report.

29608 (SAND—86-0303C) Innovative point-focus concentrator projects. Mancini, T.R. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 5p. (CONF-860655—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009628.

From American Solar Energy Society annual meeting and 11. national passive solar conference; Boulder, CO, USA (8 Jun 1986).

Three point-focus concentrator designs were funded in late 1984 and early 1985 through the Department of Energy (DOE) Solar Thermal Program's Innovative Concentrator Project. The purpose of the program is to develop efficient, low cost solar concentrators as sources of high temperature thermal energy and for electrical power generation. Specific performance and survivability criteria must be met by each design. In addition, the concentrators are to be modular and mass producible, economic to manufacture, operate and maintain, and have low life-cycle costs.

29609 (SAND—86-8007) Evaluation of heliostat field/receiver configurations. Faas, S.E.; Winters, W.S. (Sandia National Labs., Livermore, CA (USA)). Mar 1986. Contract AC04-76DR00789. 75p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009875.

This report evaluates and compares north heliostat field/cavity receiver configurations and surround heliostat field/external receiver configurations. The receiver coolants are molten nitrate salts and liquid sodium. Both field/receiver configurations use molten salt thermal storage; the sodium receiver is thermally connected to thermal storage by a sodium-to-salt heat exchanger. The heliostat filed size is fixed at 1,000,000 square meters of reflective area, and the delivered molten salt temperature is fixed at 566°C. The delivered thermal power varies from 500 to 600 MW/sub t/, depending on the overall system efficiency. The generic north heliostat field/cavity receiver configurations were found to be 6 to 10 percent efficient than a generic surround field/external receiver configuration. There was little or no difference found in the transient performance of a molten salt receiver compared to a sodium receiver connected to a sodium-to-salt heat exchanger. Four configurations were of particular interest: (1) a north heliostat field/single cavity molten salt receiver, (2) a surround heliostat field/external cylinder molten salt receiver, (3) a surround heliostat field/external cylinder liquid sodium receiver, and (4) a north heliostat field/single cavity liquid sodium receiver. It was found that the surround field/liquid sodium external receiver configuration may provide energy at a 14 percent lower levelized energy cost than a north field/molten salt cavity receiver configuration. However, the cost advantage of the surround field/liquid sodium external receiver is not conclusive because of uncertainties in system component costs.

29610 Method of bonding silver to glass and mirrors produced according to this method. Pitts, J. R.; Czanderna, A. W.; Thomas, T. M. (to The United States of America as represented by the United States Department of Energy). US Patent 4,547,432. 15 Oct 1985. Filed date 31 Jul 1984. vp.

PAT-APPL-636511.

A method for adhering silver to a glass substrate for producing mirrors includes attaining a silicon enriched substrate surface by reducing the oxygen therein in a vacuum and then vacuum depositing a silver layer onto the silicon enriched surface. The silicon enrichment can be attained by electron beam bombardment, ion beam bombardment, or neutral beam bombardment. It can also be attained by depositing a metal, such as aluminum, on the substrate surface, allowing the metal to oxidize by pulling oxygen from the substrate surface, thereby leaving a silicon enriched surface, and then etching or eroding the metal oxide layer away to expose the silicon enriched surface. Ultraviolet rays can be used to maintain dangling silicon bonds on the enriched surface until covalent bonding with the silver can occur. This disclosure also includes encapsulated mirrors with diffusion layers built therein. One of these mirrors is assembled on a polymer substrate.

29611 Photovoltaic concentrator research status. Arvizu, D.E. (Sandia National Lab., Alburquerque, NM 87185). pp 236-244 of Proceedings of the sixth E.C. photovoltaic solar energy conference. Palz, W.; Treble, F.C. Boston, MA; D. Reidel Pub. Co. (1985). (CONF-850408—).

From 6. European photovoltaic solar energy conference and exhibition; London, UK (15 Apr 1985).

This paper describes the most important developments in concentrator research and development since the fifth E.C. Photovoltaic Energy Conference in October, 1983 (1). Within the Sandia managed Photovoltaic Concentrator Research Project several record cell efficiencies have been reported. Applied Solar Energy Corporation has fabricated a concentrator silicon cell with 20.9% peak efficiency, at 90X concentration. Varian Associates has demonstrated a 26.0% efficient GaAs cell at 700X concentration. Hughes Research Labs together with Applied Solar Energy Corporation and Sandia has demonstrated a 24.7% efficient, at 70X concentration, mechanically-stacked multijunction device using GaAs on silicon. In addition, a record efficiency for silicon technology has been demonstrated with the Sandia developed 200X silicon module. The module has been measured to have 17% peak efficiency. This paper reviews these accomplishments, other research progress, and current research directions in concentrator cells, modules, and arrays. A brief economic assessment is also presented wich indicates the potential of concentrator technology.

1420 Heat Storage

REFER ALSO TO CITATION(S) 29590

29612 (NBSIR—86-3325) Inorganic compounds for passive solar energy storage. Solid-state dehydration materials and high specific heat materials. Progress report. Struble, L.J.; Brown, P.W. (National Bureau of Standards, Washington, DC (USA)). Apr 1986. Contract AI01-76PR06010. 69p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86010214.

Two classes of hydrated inorganic salts have been studied to assess their potential as materials for passive solar energy storage. The materials are part of the quaternary system CaO-Al_2O_3-SO_3-H_2O and related chemical systems, and the two classes are typified by ettringite, a trisubstituted salt, and Friedel's salt, a monosubstituted salt. The trisubstituted salts were studied for their possible application in latent heat storage, utilizing a low-temperature dehydration reaction, and both classes were studies for their application in sensible heat storage. In order to assess their potential for energy storage, the salts have been synthesized, characterized by several analytical techniques, and thermal properties measured. The dehydration data of that the trisubstituted salts vary somewhat with chemical composition, with the temperature of the onset of dehydration ranging from 6°C to 33°C, and enthalpy changes on dehydration ranging from 60 to 200 cal/g. Heat capacity is less variable

with composition; values for the trisubstituted phases are 30 cal/g/°C and for the monosubstituted phases between 0.23 and 0.28 cal/g/°C. Preliminary experiments indicate that the dehydration is reversible, and suggest that the materials might have additional potential as solar desiccant materials. These thermal data demonstrate the trisubstituted salts have potential as latent heat storage materials, and that both classes of salts have potential as sensible heat storage materials.

15 GEOTHERMAL ENERGY

REFER ALSO TO CITATION(S) 29908, 29982

1501 Resource Status And Assessment

REFER ALSO TO CITATION(S) 29914, 29981

29613 (CONF-8509142—, pp 11-13) **Status of US geothermal industry.** Lacy, R.G. (San Diego Gas and Electric, CA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Forces were at work in the early- to mid- 1970's which pointed to a rosy future and the rapid development of the geothermal industry for the production of electric power. During the past ten years, the industry has seen a dramatic downturn. Utilities are not exercising options for new generation. As a result, the geothermal industry is going through a period of retrenchment and the names of the players are changing. The importance of current industry activities, a possible scenario for the near-term future of the industry during the rest of this century, and the need for additional work are discussed.

29614 (CONF-8509142—, pp 49-53) **Geothermal reservoir technology.** Lippmann, M.J. (Lawrence Berkeley Lab., CA). 1985. NTIS, PC A09/MF A01. File Number DE86004074. Contract AC03-76SF00098.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

A status report on Lawrence Berkeley Laboratory's Reservoir Technology projects under DOE's Hydrothermal Research Subprogram is presented. During FY1985 significant accomplishments were made in developing and evaluating methods for describing geothermal systems and processes; predicting reservoir changes; mapping faults and fractures; and field data analysis. In addition, LBL assisted DOE in establishing the research needs of the geothermal industry in the area of Reservoir Technology. These activities, as well as plans for FY 1986 are outlined. 15 references, 5 figures, 1 table.

29615 (CONF-8509142—, pp 77-80) **Geothermal assessment in the Bonneville Power Administration service area.** Seely, D.B. (Bonneville Power Administration, Portland, OR). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Bonneville Power Administration (BPA) has developed geothermal resource and engineering data bases to provide information and guidance in making generation planning decisions. Preliminary analysis indicates that different reservoir confirmation strategies may be appropriate depending on the geologic province being addressed. Future planning activities will address implementation mechanisms for confirming the region's geothermal resources. 1 table.

29616 **(GESC—85-9,C) Summary of the geothermal prospects for the United Kingdom. Final report of the British Geological Survey's Geomthermal Energy Programme 1979-1984.** (British Geological Survey, Keyworth (UK)). 1985. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86751869.

The United Kingdom forms part of the stable foreland of north-west Europe. The average background surface heat flow is about 52 mW/m^2. Above average values are associated with granite batholiths in Cornwall, northern England and the Eastern Highlands of Scotland and are also found over several deep Mesozoic basins. There are two potential sources of geothermal energy - low enthalpy, groundwater resources in deep sedimentary basins and heat stored in impermeable rocks, "hot dry rocks", at temperatures of more than 100°C and depths of more than 3 to 4 km. Low enthalpy geothermal resources occur in Permo-Triassic sandstones in the major Mesozoic basins, at temperatures of more than 40°C and 60°C, at depths of about 1 and 2 km respectively. Resources also occur in Upper Palaeozoic rocks but the occurrence of suitable conditions for their development has not been proved. The granite batholith of Cornwall has been recognised for some years as a hot dry rock target. A temperature of 200°C might be attained at a depth of 5.4 km. The granites of the Lake District and Weardale could also have potential as well as basement rocks where buried below thick, low conductivity Mesozoic and Upper Palaeozoic sequences. The Accessible Resource Base (ARB) to a depth of 7 km is 2.75 x 10^{22} joules and the Hot Dry Rock ARB at temperatures of more than 100°C and depths of less than 7 km is 36 x 10^{21} joules. The low enthalpy Geothermal Resource of the permo-Triassic sandstones, at more than 40°C, amounts to 220 x 10^{18} joules, and the Identified Resource is 52 x 10^{18} joules, assuming use of doublets and heat pumps for water at less than 60°C. The most promising area for water at more than 60°C is in the Triassic sandstones in the western part of the Wessex Basin, while the major resource in the 40 to 60°C range is in the same sandstones in east Yorkshire and Lincolnshire.

29617 **(NYSERDA—84-8) Heat flow and subsurface temperature distributions in central and western New York. Final report.** Hodge, D.S.; Fromm, K. (State Univ. of New York, Buffalo (USA). Dept. of Geological Sciences). Jan 1984. 215p. New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223. File Number TI86901097.

Initiation of a geothermal energy program in western and central New York requires knowledge of subsurface temperatures for targeting areas of potential resources. The temperature distribution in possible geothermal reservoirs, calculated from heat flow measurements and modeling techniques, shows that a large area of New York can be considered for exploitation of geothermal resources. Though the temperatures at currently accessible depths show the availability of only a low-temperature (less than 100°C), direct-use resource, this can be considered as an alternative for the future energy needs of New York State. From analysis of bottom-hole-temperature data and direct heat flow measurements, estimates of temperatures in the Cambrian Sandstones provide the basis of the economic evaluation of the reservoir. This reservoir contains the extractable fluids needed for targeting a potential geothermal well site in the low-temperature geothermal target zone. In the northern section of the Appalachian basin, reservoir temperatures in the Cambrian are below 50°C but may be over 80°C in the deeper parts of the basin in southern New York State. Using a minimum of 50°C as a useful reservoir temperature, temperatures in excess of this value are encountered in the Theresa Formation at depths in excess of 1300 meters. Considering a maximum depth for economical drilling to be 2500 meters with present technology, the 2500 meters to the Theresa (sea level datum) forms the lower limit of the geothermal resource. Temperatures in the range of 70°C to 80°C are predicted for the southern portion of New York State.

1502 Geology And Hydrology Of Geothermal Systems

REFER ALSO TO CITATION(S) 29640, 29915, 30747

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 29641, 29915, 29981, 30747

29618 (CONF-8509142—, pp 45) **Salton Sea scientific drilling program: drilling program status.** Harper, C.A. (Bechtel National, Inc., San Francisco, CA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The project is within a few weeks of the start of drilling. At this time, major components of the program scope are as follows: total depth is targeted for 10,000 ft; $1 million is budgeted for coring, which could yield over 1000 ft of core; three limited flow tests are planned; over 250 hours are allocated for logging and downhole sampling during drilling; an additional 6 month standby period will be available for monitoring and sampling after drilling is completed. 2 figures.

29619 (CONF-8509142—, pp 139-140) **Overview on Cascades drilling status.** Prestwich, S.M. 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

DOE initiated the Cascades Deep Thermal Gradient Drilling Program through solicitations issued in FY85. The agency budgeted approximately $1 million of FY85 funds to issue a solicitation which would allow DOE to cost-share at 50% of the drilling of up to eight thermal gradient holes. The overall program is planned to drill deep thermal gradient holes. The overall program is planned to drill deep thermal gradient holes and gather data, conduct supporting research with data integration and interpretation, and transfer this information to the public to encourage further exploration and development of the Cascades hydrothermal resources. The FY86 Geothermal Program budget proposes an additional $1 million to support research and additional thermal gradient drilling. 1 figure.

29620 (CONF-8509142—, pp 141-146) **Development and application of tracers: examples of field and experimental studies.** Adams, M.C.; Moore, J.N. (Univ. of Utah Research Institute, Salt Lake City). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

During the past two years the University of Utah Research Institute has been involved in tracer research and testing, largely through the DOE Injection Research program. Of the new tracers tested, the fluorinated and sulfonated hydrocarbons appear to be superb candidates. Compounds have been found which are more stable than the organic dyes currently used by the geothermal industry. The stabilizing and destabilizing effects of the geothermal environment on the organic dye fluorescein have been identified and quantified. 6 references, 9 figures.

29621 (CONF-8509142—, pp 147-154) **Borehole geophysical techniques for defining permeable zones in geothermal systems.** Wright, P.M.; Ward, S.H. (Univ. of Utah Research Institute, Salt Lake City). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Borehole electrical geophysical methods have considerable potential for helping to define hot and permeable zones in geothermal systems. Borehole geophysics differs from geophysical well logging and has a much greater area of search around a borehole. Very little developmental work has taken place in borehole electrical methods to date. At UURI, the authors have been developing computer methods to model various electrical arrays for borehole configurations. The authors plan to compare the several possible survey methods and then design a field system based on the method that appears from the computer studies to be optimum. From the studies to date it is tentatively concluded that the cross-borehole method produces larger anomalies that does the single-borehole method; cross-borehole anomalies using a pole-pole array are smaller than these for a dipole-dipole array; the cross-borehole mise-a-la-masse method produces larger anomalies than does other cross-borehole methods; and, the anomalies due to a thin structure are generally much smaller than those for a sphere, as is to be expected. 21 references, 7 figures.

29622 (LA—10659-HDR-Vol.1) **Exploration for Hot Dry Rock geothermal resources in the Midcontinent USA. Volume 1. Introduction, geologic overview, and data acquisition and evaluation.** Hinze, W.J.; Braile, L.W.; von Frese, R.R.B.; Lidiak, E.G.; Denison, R.E.; Keller, G.R.; Roy, R.F.; Swanberg, C.A.; Aiken, C.L.V.; Morgan, P. (Los Alamos National Lab., NM (USA)). Feb 1986. Contract W-7405-ENG-36. 156p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE86009794.

The Midcontinent of North America is commonly characterized as a stable cratonic area which has undergone only slow, broad vertical movements over the past several hundreds of millions of years. This tectonically stable crust is an unfertile area for hot dry rock (HDR) exploration. However, recent geophysical and geological studies provide evidence for modest contemporary tectonic activity in limited areas within the continent and, therefore, the possibility of localized thermal anomalies which may serve as sites for HDR exploration. HDR, as an energy resource in the Midcontinent, is particularly appealing because of the high population density and the demand upon conventional energy sources. Five generalized models of exploration targets for possible Midcontinent HDR sites are identified: (1) radiogenic heat sources, (2) conductivity-enhanced normal geothermal gradients, (3) residual magnetic heat, (4) sub-upper crustal sources, and (5) hydrothermal generated thermal gradients. Three potential sources of HDR, each covering approximately a 2° x 2° area, were identified and subjected to preliminary evaluation. In the Mississippi Embayment test site, lateral thermal conductivity variations and subcrustal heat sources may be involved in producing abnormally high subsurface temperatures. Studies indicate that enhanced temperatures are associated primarily with basement rift features where vertical displacement of aquifers and faults cause the upward migration of hot waters leading to anomalously high local upper crustal temperatures. The Western Nebraska test site is a potential low temperature HDR source also related, at least in part, to groundwater movement. The Southeast Michigan test site was selected for study because of the possible presence of radiogenic plutons overlain by a thickened sedimentary blanket.

29623 (SAND—85-2712C) **Use of an acoustic borehole televiewer to investigate casing corrosion in geothermal wells.** Carson, C.C.; Bauman, T. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1986. Contract AC04-76DP00789. 16p. (CONF-860304—7). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009623.

From Corrosion '86; Houston, TX, USA (17 Mar 1986).

Corrosion of well and surface equipment due to the presence of hot, corrosive brines is one of the major problems facing geothermal operators. For wellbore casing, this problem is complicated by the fact that in-place inspection is difficult at best. In an attempt to improve this situation, a prototype acoustic borehole televiewer designed to operate in geothermal wells was used to study the corrosion damage to casing in three commercial wells. The results of this experiment were promising. The televiewer returns helped to define areas of major corrosion damage and to indicate the extent of the damage. This paper briefly discusses the corrosion problem, describes the acoustic borehole televiewer, and then summarizes the results of the field test of the televiewer's capability for investigating corrosion.

29624 **Convective heat flow probe.** Dunn, J. C.; Hardee, H. C.; Striker, R. P. (to The United States of America as represented by the United States Department of Energy). US Patent 4,547,080. 15 Oct 1985. Filed date 9 Jan 1984. vp. PAT-APPL-569086.

A convective heat flow probe device is provided which measures heat flow and fluid flow magnitude in the formation surrounding a borehole. The probe comprises an elongate housing adapted to be lowered down into the borehole; a plurality of heaters extending along the probe for heating the formation surrounding the borehole; a plurality of temperature sensors arranged aroung the periphery of the probe for measuring the temperature of the surrounding formation after heating thereof by the heater elements. The temperature sensors and heater elements are mounted in a plurality of separate heater pads which are supported by the housing and which are adapted to be radially expanded into firm engagement with the walls of the borehole. The heat supplied by the heater elements and the temperatures measured by the temperature sensors are monitored and used in providing the desired measurements. The outer peripheral surfaces of the heater pads are configured as segments of a cylinder and form a full cylinder when taken together. A plurality of temperature sensors are located on each pad so as to extend along the length and across the width thereof, with a heating element being located in each pad beneath the temperature sensors. An expansion mechanism driven by a clamping motor provides expansion and retraction of the heater pads and expandable packer-type seals are provided along the probe above and below the heater pads.

1505 Economic And Financial Aspects

REFER ALSO TO CITATION(S) 29613

29625 (CONF-8509142—, pp 81-84) **Technology transfer on the heber geothermal binary demonstration power plant project.** Budney, G.S. (Energy Technology Engineering Center, Canoga Park, CA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Federal and DOE policy is to promote technological innovation and facilitate technology transfer to the public and private sectors. This paper describes the principal elements of the technology transfer plan and how it has been applied to the Heber Geothermal Binary Demonstration Power Plant project. 2 figures.

29626 (CONF-8509142—, pp 85-88) **Federal geothermal technology transfer activities.** Entingh, D.J. (Meridian Corp., Falls Church, VA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

GTD's FY-1985 explicit Technology Transfer budget was substantially higher than in previous years. This gave GTD the opportunity to pursue some important new initiatives. Those activities are described in terms of the generic technology transfer functions. 1 table.

1508 Geothermal Power Plants

REFER ALSO TO CITATION(S) 29625, 29913

29627 (CONF-8509142—, pp 33-37) **Heber binary project.** Nelson, T.T.; Lacy, R.G. (San Diego Gas and Electric, CA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The need to demonstrate commercial scale, binary cycle, geothermal technology was first expressed in the mid-1970's in EPRI Report ER-1099. From those initial conceptual plans, the Heber Binary Project has finally evolved into an operating plant. Engineering was kicked off in early 1981, and construction at the site began in June 1983. Construction was completed in June 1985, and following the start-up phase, the generator was synchronized in June 1985. Initial component data is starting to be gathered, and, as the second phase of brine field development comes on stream, more plant data will become available. A two-year, full-load demonstration period ending in 1988 is planned for the plant before it goes into commercial operation. 1 figure, 1 table.

29628 (CONF-8509142—, pp 39-44) **Research on geothermal chemistry and advanced instrumentation.** Robertus, R.J.; Shannon, D.W.; Sullivan, R.G.; Kindle, C.H.; Pool, K.H. (Pacific Northwest Lab., Richland, WA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Research at the Pacific Northwest Laboratory (PNL) focuses on long-term geothermal power plant reliability. Past work concentrated on development of continuous high-temperature probes for monitoring process variables. PNL also completed a comprehensive handbook of brine treatment processes as they relate to injection well longevity. A recently completed study analyzed corrosion in the hydrocarbon system of a binary cycle plant. Over the two-year monitoring period, corrosion rates were less than 1 MPY in any part of the hydrocarbon system. The system was kept completely dry so the rates seem reasonable. Present projects include: determination of gas breakout conditions at the Heber Binary Demonstration Plant; generation of water mixing solubility data; installation of prototype leak detectors at the Heber Plant; and the evaluation of state-of-the-art particle counters. 7 references, 9 figures.

29629 (EGG-EP—7076) **Supercritical binary geothermal cycle experiments with mixed-hydrocarbon working fluids and a vertical, in-tube, counterflow condenser.** Demuth, O.J.; Bliem, C.J.; Mines, G.L.; Swank, W.D. (EG and G Idaho, Inc., Idaho Falls (USA)). Dec 1985. Contract AC07-76ID01570. 224p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE86009105.

The objective is improved utilization of moderate temperature geothermal resources. Current testing involves supercritical vaporization and counterflow in-tube condensing in an organic Rankine cycle. This report presents a description of the test facility and results from a part of the program in which the condenser was oriented in a vertical attitude. Results of the experiments for the supercritical heaters and the countercurrent, vertical, in-tube condenser are given for both pure and mixed-hydrocarbon working fluids. The heater and condenser behavior predicted by the Heat Transfer Research, Inc. computer codes used for correlation of the data was in excellent agreement with experimental results. A special series of tests, conducted with propane and up to approximately 40% isopentane concentration, indicated that a close approach to "integral" condensation was occurring in the vertically-oriented condenser.

1509 Geothermal Engineering

REFER ALSO TO CITATION(S) 29909, 29911, 29912

29630 (CONF-8509142—, pp 63-68) **Advanced materials for geothermal energy processes.** Kukacka, L.E. (Brookhaven National Lab., Upton, NY). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Geothermal Technology Division initiated the Geothermal Materials Program in 1976 to ensure that the private sector development of geothermal energy resources is not constrained by the availability of technologically and economically viable materials of construction. Since 1978 Brookhaven National Laboratory (BNL) has provided technical and managerial assistance. Major successes have been attained in the development of elastomers for high-temperature applications and in the use of polymer concrete liners for corrosion protection. Both technologies have been successfully transferred to industry. In the case of the high temperature Y-267 EPDM elastomer, the operating limits for elastomeric parts were increased from the range 149°C-204°C to 260°C-316°C. Based upon extensive testing no better elastomer for geothermal service is known. Current uses include seals in logging tools, casing packers, gate valves, BOP rams, shock subs, and jars. The materials program has also produced the most comprehensive and thorough examination for the geothermal cementing problem undertaken thus far. The first known downhole testing of cements in a flowing geothermal well was conducted. Nine cements satisfied the test criteria. Unfortunately the exposure temperature was only 214°C, and it is

considered essential to have data at a temperature of at least 300°C before definitive conclusions can be made. Research and development efforts aimed at further cost reductions and extension of service life are currently in progress. Tasks include high temperature elastomers for dynamic sealing applications, advanced materials for lost circulation control, waste utilization and disposal, corrosion resistant elastomeric liners for well casing, high temperature lightweight cement, and non-metalic materials for heat exchanger applications. 9 references.

29631 (CONF-8509142—, pp 91-96) **Hot Dry Rock phase II reservoir engineering.** Murphy, H. (Los Alamos National Lab., NM). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Early attempts to hydraulically fracture and connect two wells drilled at the Hot Dry Rock site at Fenton Hill in New Mexico failed. Microearthquakes triggered by hydraulic fracturing indicated that the fracture zones grew in unexpected directions. Consequently one of the wells was sidetracked at a depth of 2.9 km; was redrilled into the zones of most intense microseismic activity; and a flow connection was achieved. Hydraulic communication was improved by supplemental fracturing using recently developed high temperature and high pressure open hole packers. Preliminary testing indicates a reservoir with stimulated joint volume which already surpasses that attained in the earlier phase I reservoir after several years of development. 12 references, 6 figures.

29632 (CONF-8509142—, pp 97-107) **Inert and reacting tracers for reservoir sizing.** Tester, J.W. (Massachusetts Institute of Technology, Cambridge). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Flow characterization and volumetric sizing techniques using tracers in fractured hot dry rock (HDR) reservoirs are discussed. Mathematical methods for analyzing the residence time distribution (RTD) are presented. Tracer modal volumes and RTD shape are correlated with reservoir performance parameters such as active heat transfer area and dispersion levels. Chemically reactive tracers are proposed for mapping advance rates of cooled regions in HDR reservoirs, providing early warning of thermal drawdown. Important reaction rate parameters are identified for screening potential tracers. 9 references, 6 figures, 3 tables.

29633 (CONF-8509142—, pp 107-113) **Open hole packer and running procedure for Hot Dry Rock reservoir testing.** Dreesen, D.S.; Miller, J.R. (Los Alamos National Lab., NM). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

An acute need for open hole packers for high pressure, high temperature operations at the Fenton Hill, Hot Dry Rock (HDR) Geothermal Site has existed since 1981. Cemented-in-liners were used instead of packers while packer technology was brought up to HDR requirements. A reservoir development and evaluation program has just been completed with 5 successful open hole packer runs. These 5 successful runs were the result of: R and D leading to improved packer materials and design, an improved understanding of the interactions between the packer assembly and its hostile down hole environment, and, a carefully planned logging, sampling and coring program to locate packer setting depths (packer seats). 5 references, 4 figures, 3 tables.

29634 (CONF-8509142—, pp 115-118) **Earth science instrumentation update review FY1985.** Dennis, B.R. (Los Alamos National Lab., NM). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

As part of the work going on at the Hot Dry Rock Fenton Hill Complex, several instrument development tests were performed. Tests were conducted on a new FM multiplex system installed in a downhole geophone package. Field tests were also run on a combination temperature/spinner/pressure sonde with a collar locator. Field tests were also conducted using the acoustic subassembly from the borehole acoustic televiewer to provide preliminary operational data. 4 references, 5 figures.

29635 (CONF-8509142—, pp 127-130) **Drilling technology/GDO.** Kelsey, J.R. (Sandia National Labs., Albuquerque, NM). 1985. NTIS, PC A09/MF A01. File Number DE86004074. Contract AC04-76DP00789.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Geothermal Technology Division of the DOE is sponsoring two programs related to drilling technology. The first is aimed at development of long term high-risk technology that will lead to reduced costs of drilling, completion, and logging of geothermal wells. The second program is intended to share with private industry the cost of development of technology that will result in solutions to the near term geothermal well problems. This program is referred to as the Geothermal Drilling Organization, or GDO. This paper details the past year's activities and accomplishments and projects the plans FY86 for these two programs. 2 tables.

29636 (CONF-8509142—, pp 175-178) **Scale control in geopressured energy production.** Matty, J.M.; Waggett, G.G.; Varughese, D.; Durrett, L.R.; Tomson, M.B. (Rice Univ., Houston, TX). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The general mechanism of scale formation is understood, and various techniques are available to control it, e.g., chemical inhibitors. The scale-forming tendency may be calculated mathematically if the initial and final conditions are adequately known. A saturation index (SI) has been developed to quantify the scaling tendency of any calcium carbonate brine. A semiquantitative understanding of the processes of scale formation at various SI levels has been developed by the authors via both laboratory and field observations. In order to eliminate the uncertainty associated with calculated SI values, a ΔSI scheme was developed. A series of tests, 20 to 30 days each, were run at the DOE Gladys McCall No. 1 geopressured well near Grand Chenier, Louisiana. Scale formation has been successfully controlled in the surface equipment by threshold scale inhibitors. When the saturation index increased to above about 1.2 to 1.4, scale formed in the production tubing. This severely limited the feasible sustained production rate. Therefore, an inhibitor squeeze was designed and tested in the laboratory and in the field. The inhibitor squeeze treatment has been successful, allowing production to increase by about 100% without scale formation in the tubing or surface equipment. 6 references, 3 figures, 2 tables.

29637 (DOE/ER/80108—T1) **Shape memory alloy seals for geothermal applications.** (Memory Metals, Inc., Stamford, CT (USA)). 1985. Contract AC01-84ER80108. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86008099.

A shape memory radial seal was fabricated with a "U" cross section. Upon heating the seal recovered its original "V" shape and produced a high pressure seal. The sealing pressure which can be developed is approximately 41 MPa (60,000 psi), well in excess of the pressure which can be produced in conventional elastomeric seals. The low modulus martensite can conform readily to the sealing surface, and upon recovery produce a seal capable of high pressure fluid or gas confinement. The corrosion resistance of nickel-titanium in a broad range of aggressive fluids has been well established and, as such, there is little doubt that, had time permitted, a geothermal pump of flange fluid tried would have been successful.

29638 (DOE/NV/10081—3-Pts.1-2) **Sweet Lake geopressured-geothermal project, Magma Gulf-Technadril/DOE Amoco fee. Volume III. Final report. Annual report, February 1982-March 1985.** Durham, C.O. Jr.; O'Brien, F.D.; Rodgers, R.W. (eds.). (Magma Gulf/Technadril, Houston, TX (USA)). 1985. Contract AC07-80NV10081. 476p. NTIS, PC A21/MF A01; 1; GPO Dep. File Number DE85016048.

This report presents the results of the testing of Sand 3 (15,245 to 15,280 feet in depth) which occurred from November 1983 to March 1984 and evaluates these new data in comparison to results from the testing of Sand 5 (15,385 to 15,415 feet in depth) which occurred from June 1981 to February 1982. It also describes the reworking of the production and salt water disposal wells preparatory to the Sand 3 testing as well as the plug and abandon procedures requested to terminate the project. The volume contains two parts: Part 1 includes the text and accompanying plates, figures and tables; Part 2 consists of the appendixes including auxiliary reports and tabulations.

29639 **(SAND—85-2843) FY 1984 and FY 1985 geochemistry and materials studies in support of the Magma Energy Extraction Program.** Westrich, H.R.; Weirick, L.J.; Cygan, R.T.; Reece, M.; Hlava, P.F.; Stockman, H.W.; Gerlach, T.M. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1986. Contract AC04-76DP00789. 66p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009558.

Geochemistry and materials studies are being performed in support of the Magma Energy Extraction Program. The work is largely restricted to: (1) characterizing magmatic environments at sites of interest, (2) testing engineering materials in laboratory simulated magmatic environments, (3) investigating chemical mass transport effects inherent in designs for direct contact heat exchangers, and (4) evaluating degassing hazards associated with drilling into and extracting energy from shallow magma. Magma characterization studies have been completed for shallow magma at Long Valley, Coso volcanic field, and Kilauea volcano. The behavior of 17 commercially available materials has been examined in rhyolite magma at 850°C and 200 MPa for periods up to seven days. Analysis of reaction products from materials tests to date indicate that oxidation is the main corrosion problem for most alloys in rhyolitic magma. Considerations of corrosion resistance, high-temperature strength, and cost indicate nickel-base superalloys offer the most promise as candidates for use in rhyolitic magma.

1520 Geothermal Data And Theory

29640 (CONF-8509142—, pp 69-75) **Geological and geochemical techniques for fracture definition in geothermal reservoirs.** Nielson, D.L.; Moore, J.N. (Univ. of Utah Research Institute, Salt Lake City). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

Geothermal energy will not be considered a truly renewable energy resource until the mysteries surrounding fracture geometry and fluid-rock interaction are solved. Several new approaches are described that had not previously been applied to active geothermal systems. The methods have yielded significant new insight into fracture formation at Baca and on the chemistry and compositional variations of the brines in the Imperial Valley. Additional research into geological models of fractured geothermal reservoirs is needed. 16 references, 5 figures, 1 table.

29641 (CONF-8509142—, pp 131-136) **Magma energy and geothermal permeability enhancement programs.** Dunn, J.C. (Sandia National Labs., Albuquerque, NM). 1985. NTIS, PC A09/MF A01. File Number DE86004074. Contract AC04-76DP00789.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Magma Energy Extraction and Permeability Enhancement programs are both US Department of Energy, Geothermal Technology Division, programs managed by Sandia National Laboratories. Project funding during FY85 was $1.4 M for magma energy and $650 K for permeability enhancement. Accomplishments during FY85 and project plans for FY86 are described for both programs.

29642 **(DOE/SF/15799—T5) Geothermal research at the Puna Facility. Technical report.** Chen, B. (Hawaii Univ., Honolulu (USA). Hawaii Natural Energy Inst.). Apr 1986. Contract FG03-85SF15799. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009327.

This report consists of a summary of the experiments performed to date at the Puna Geothermal Research Facility on silica in the geothermal fluid from the HGP-A well. Also presented are some results of investigations in commercial applications of the precipitated silica. (ACR)

16 TIDAL AND WAVE POWER

1608 Wave Energy Converters

29643 **(ETSU-R—26) Wave energy. The Department of Energy's R and D programme 1974-1983.** Davies, P.G. (ed.); Cloke, M.S.; Major, K.A.; Page, D.I.; Taylor, R.J. . (UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.). Mar 1985. 122p. H.M. Stationery Office, London, price Pound 8.00.

A report is given of the UK Department of Energy's R and D programme on Wave Energy in the period 1974-1983. The various, original concepts designed to extract energy from the sea waves are outlined. Points covered include the size of the energy resource, the structures of the convertors, their mooring and anchoring, power conversion and maintenance. From these, the mean annual electrical output and its cost are estimated for each type of wave power station. Finally, the impacts on man and the environment and prospects for the future are discussed. (UK).

17 WIND ENERGY

1705 Environmental Aspects

29644 **(STEV-VIND—85-15) Measurements of TV-interference from the wind power plant at Maglarp.** Sundberg, L.; Tegth, U.; Sjoeberg, B. (Televerket, Farsta (Sweden)). Jan 1984. 19p. (In Swedish). (TELEVERKET-RF—84-001). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751680.

This paper reports the measurements of the disturbance of the television reception caused by the wind power plant at Maglarp. The actual zon inteference was different from the expected. The sector was broader than calculated and disturbances could be noticed 2 km in front of the plant.

1706 Wind Energy Engineering

29645 (ETSU-R—36, pp 17-23) **R and D needs in wind energy - the manufacturers view.** Wilson, R.R. (James Howden and Co. Ltd., Glasgow, GB). 1985. NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892. (CONF-8509285—).

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

The key objective of the wind energy industry to make wind turbines which can be sold at a profit and create a viable business is discussed. Basic requirements for research identified include provision of information to encourage the early development of a market; removal of the uncertainty involved in wind turbine design thus reducing the cost of a machine; and options for the longer term development of innovative concepts in wind turbines technology. (author).

29646 (ETSU-R—36, pp 27-43) **R and D needs in wind energy - a utility's view based on experience.** Stevenson, W.H. (North of Scotland Hydro-Electric Board, Edinburgh, UK). 1985. NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892. (CONF-8509285—).

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

Since the oil crisis of 1973 the North of Scotland Hydro-Electric Board has adopted a long term strategy for minimising the dependence on oil fuel used in making supplies available on the main island groups. The association of the Board with wind turbine

generator installations and the identification of factors involved in developing reliable economic assessments are discussed. (author).

29647 (ETSU-R—36, pp 47-61) **Generic wind studies in the DEn programme.** Page, D.I. (UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.). 1985. NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892. (CONF-8509285—).

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

The aim of the DEn programme to establish the technical feasibility and the economic potential of the generation of electricity by large WIGs is discussed. The factors governing the economics of power generation are examined to identify technical topics for investigation on the assumption that high cost areas merit investigation as promising the greatest potential savings in cost and hence reduction in the price of electricity, and uncertainties in cost figures generally reflect reflect uncertainties in the technical knowledge in that area. (author).

29648 (ETSU-R—36, pp 65-69a) **SERC support for research in wind energy.** Walker, T.G. (Rutherford Appleton Lab., Chilton, UK). 1985. NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892. (CONF-8509285—).

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

SERC is currently providing support for research in wind energy at an annual level of about Pound300K. The work is predominantly associated with small machines in the areas of aerodynamics, electrical systems, integration into isolated networks and modelling. (author).

29649 (ETSU-R—36, pp 73-91) **R and D on wind power in the CEGB.** Taylor, R.H. (Central Electricity Generating Board, London, UK). 1985. NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892. (CONF-8509285—).

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

The main areas of R and D being carried out as part of the CEGB's programme are presented as vu-graphs covering meteorology and resource, wakes and clusters, measurement and analysis of data from machines, offshore systems, environmental and safety aspects and system integration studies. The vu-graphs on the following pages detail each area of work. (author).

29650 (ETSU-R—36, pp 95-100) **DTI support for commercial wind turbines.** Elliot, G. (National Engineering Lab., East Kilbride, UK). 1985. NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892. (CONF-8509285—).

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

The DTI's Support for Innovation Scheme (SFI) programme on the development of commercial WECS, generally in the small to medium size range (up to 300 KW at present) is described. The creation of the National Wind Turbine Centre, available facilities, other support activities and the need to improve cost effectiveness and environmental acceptability of wind turbines, are discussed. (author).

29651 (ETSU-R—36) **R and D needs in wind energy.** (UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.). 1985. 82p. (CONF-8509285—). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892.

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

Discussion meeting papers are presented and cover priority areas for underlying research, manufacturer's and utility's views and general studies. Research undertaken by the CEGB, SERC funding for wind energy research and the DTI support for commercial wind turbines are reviewed. (UK).

29652 (ETSU-R—36, pp 7-13) **Priority areas for underlying research.** Swift-Hook, D.T. (Central Electricity Research Labs., Leatherhead, UK). 1985. NTIS (US Sales Only), PC A05/MF A01. File Number DE86751892. (CONF-8509285—).

From BWEA-Department of Energy workshop on R and D needs in wind energy; Harwell, UK (10 Sep 1985).

The key areas in which there is a need for basic spear-heading research are reviewed and cover structural and aerodynamic aspects; system integration and the multi-disciplinary problems of offshore location; and, innovation for new systems of components. (author).

29653 (Juel-Spez—304) **Implementing agreement for cooperation in the development of large scale wind energy conversion systems.** (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Projektleitung Energieforschung). Mar 1985. 177p. (CONF-8410401—). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709.

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

Processes for calculating the aerodynamics of wind turbine blades are at the forefront of the following reports. The proposed methods are supported by results of measurements. The present volume contains 12 reports, which are covered separately according to their contents. (BWI).

29654 (Juel-Spez—304, pp 3-28) **Polar measurements on profiles.** Althaus, D. (Stuttgart Univ., Germany, F.R. Inst. fuer Aerodynamik und Gasdynamik). Mar 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

Wind tunnel models with a profile depth of t=0.5 m were measured in a laminar wind tunnel by the usual measuring processes. The profile resistance was determined by integration along the width of span. The smooth profiles were examined at Re=0.7/1.0 and 1.5 million. At Re=1.0 million, the position of the changeover points were determined with a stethoscope. Also at this Reynolds number measurements were taken with a trip wire of d=2 mm diameter, directly on the profile nose. The tables contain the co-ordinates of the profiles, the contours, the theoretical speed distributions for 4 different angles of attack, the csub(a)-csub(w) polar measurements and changeover points, and the torque coefficients around the t/4 point. (BR).

29655 (Juel-Spez—304, pp 29-39) **Development in aerodynamic calculation methods.** Anderson, M.B. (McAlpine, Sir Robert and Sons Ltd., Risley, UK). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

An aerodynamic method of calculation is developed here. It contains assumptions on the load ranges, where the upthrust functions are based on a Wagner function, on the angle of attack, which is defined at 3/4 of the blade depth, on no load running, the trailing edge and the profile nose. Diagrams complete the paper. (BR).

29656 (Juel-Spez—304, pp 41-57) **Analytical theory for rotor-tipvane performance and comparison with experimental results.** Holten, T. van. (Technische Hogeschool Delft, Netherlands. Dept. of Aerospace Engineering). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

A theoretical method for the performance estimation of tipvane wind turbines is outlined in the paper, and compared with some full-scale experimental results recently obtained. The performance estimates are based on a flowmodel where an infinite number of turbine blades is assumed. Agreement between theory and experiments is shown to be satisfactory. (orig.).

29657 (Juel-Spez—304, pp 59-68) **Aerofil characteristics of rotating blades.** Milborrow, D.J.; Ross, J.N. (Central Electricity Generating Board, London, UK). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

Changes in aerofoil characteristics, due to radial outflows on the blades of axial flow fans, were first reported some 40 years ago. The studies yielded high lift coefficients, up to a maximum of 3, near the blade roots. More recently radial migration of the boundary layer on the suction surface of a blade was photographed during fan tests at CERL. This paper discusses the findings of detailed measurements made at a number of radial stations on a rotating model wind turbine blade. These also yielded lift coefficients higher than two dimensional values in the post-stall region, comparable with estimates from a recent American study, but less than the early fan test results. The present study also yielded drag coefficients which were higher than 2-D values but this may be a function of the small scale of the experiment. Further avenues of analysis are discussed which may lead to clarification of the discrepancies. (orig.).

29658 (Juel-Spez—304, pp 69-82) **Unsteady aerodynamics applied to the horizontal axis wind turbine disk.** Montgomerie, B. (Foersvarets Forskningsanstalt, Stockholm, Sweden). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

The report starts from the necessity to develop methods and processes in order to be able to calculate the dynamic behaviour of wind energy plants. A method of calculation is shown, which is exclusively concerned with the flow forces. It starts from existing flow calculation processes for horizontal axis wind turbine plants. (BR).

29659 (Juel-Spez—304, pp 83-96) **Aerodynamic theory in the calculation of the GROWIAN rotor compared with some experimental data.** Pernpeintner, R.; Huss, G.; Hau, E. (Maschinenfabrik Augsburg-Nuernberg, M.A.N. A.G., Muenchen, Germany, F.R. Bereich Neue Technologie). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

Various theories have been developed for calculating the rotor power of wind plants. They assume more or less ideal flow conditions at the rotor. The so-called 'strip theory' or 'blade element theory' has proved a useful calculation tool. The paper gives an overview of comparative calculations, which were done by this method. Also, the theoretical values are compared with experimental data from wind tunnel tests and tests on the GROWIAN rotor. (BR).

29660 (Juel-Spez—304, pp 97-102) **Aerodynamic performance of a new LM 17.2 m rotor.** Rasmussen, F. (Risoe National Lab., Roskilde, Denmark). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

The paper describes measurements of the aerodynamic properties of a 17.2 m diameter LM rotor mounted on a VESTAS 55 kW windmill. Power curves were measured for a range of blade tip angles to find the best angle both in relation to energy production and stalling characteristics. With this optimum blade setting the flapwise blade root bending moment was measured as a function of wind speed. Also the drag coefficient at 90° angle of attack is calculated from measurements of the integrated value, i.e. the flapwise blade root bending moment as a function of wind speed during stand still. With some simplified considerations the profile properties are estimated from aerodynamic calculations and the results compared to existing profile data from 3-dimensional wind tunnel measurements. The flapwise blade root bending moment versus blade angular position during one revolution was measured in skew wind and is compared with calculations. The influence of surface roughness introduced at a certain percentage of the section chord and the dependency on the Reynolds Number is investigated and discussed from observed discrepancies in the measured power curves. (orig./BWI).

29661 (Juel-Spez—304, pp 103-151) **Aerodynamic research on wind turbines at NLR.** Vries, O. de. (Nationaal Lucht- en Ruimtevaartlaboratorium, Amsterdam, Netherlands). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

The paper is limited to flow calculations for a horizontal axis wind turbine in a constant homogeneous flow of wind. 3 aspects are considered: 1. The extension of an existing rotor blade method of calculation to a turbulent condition. 2. The development of a vortex method of calculation. This is compared with results from the 'blade element theory' and empirical results. 3. The investigation of wind guide stability for narrow guidance angles. (BR).

29662 (Juel-Spez—304, pp 153-159) **Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats.** Tangler, J.L. (Solar Energy Research Inst., Golden, CO, USA. Wind Energy Research Center). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

The Solar Energy Research Institute (SERI) under contract to the U.S. Department of Energy (DOE) conducts in-house and subcontracted aerodynamic research studies. These efforts deal mainly with performance prediction and enhancement of horizontal axis wind turbines (HAWT's). Two levels of performance prediction theory are currently being used and refined while performance enhancement is being pursued through the development of new special purpose airfoils. A general purpose blade-element/momentum code (PROPSH) has been developed for rapid parametric studies and for use in annual energy calculations. A desirable feature of this code is a post-stall airfoil data synthesization routine that accounts for blade aspect ratio effects. A version of the performance code is also being developed to provide a better determination of dynamic stall effects on blade loads and performance as influenced by machine yaw angle, unsteady winds, tower shadow, and wind shear. For detailed wind turbine blade optimization, a more sophisticated lifting-surface/prescribed-wake analysis has recently been developed. This computer code is a transfer of current state-of-the-art helicopter theory into a wind turbine design analysis. The special purpose airfoil design effort is directed toward satisfying the need to tailor airfoil characteristics specifically for HAWT's. The design criteria and the current status of this effort are presented. (orig.).

29663 (Juel-Spez—304, pp 161-172) **Aerodynamic calculational methods for curved-blade Darrieus VAWT WECS.** Templin, R.J. (National Research Council of Canada, Ottawa, Ontario). Mar 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751709. (CONF-8410401—).

From 12. meeting of experts: aerodynamic calculational methods for WECS; Copenhagen, Denmark (29 Oct 1984).

This informal discussion paper describes recent Canadian experience in the development of methods of calculation of aerodynamic performance and load distributions for the curved-blade Darrieus type wind turbine. Particular attention is paid to the so-called double multiple stream tube (DMST) theory, and to the uncertainties that remain in further developing adequate methods. These include the lack of relevant airfoil data at high Reynolds numbers and high angles of attack, and doubts concerning the accuracy of current models of dynamic stall. A brief summary of wind tunnel tests of several blade aerobrake configurations is also given. (orig.).

29664 **(SAND—85-0957) Aeroelastic effects in the structural dynamic analysis of vertical axis wind turbines.** Lobitz, D.W.; Ashwill, T.D. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1986. Contract AC04-76DP00789. 23p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009542.

Aeroelastic effects impact the structural dynamic behavior of vertical axis wind turbines (VAWRs) in two major ways. First, the stability phenomena of flutter and divergence are direct results of the aeroelasticity of the structure. Secondly, aerodynamic damping can be important for predicting response levels, particularly near resonance, but also for off-resonance conditions. The inclusion of the aeroelasticity is carried out by modifying the damping and stiffness matrices in the NASTRAN finite element code. Through the use of a specially designed preprocessor, which reads the usual NASTRAN input deck and adds appropriate cards to it, the incorporation of the aeroelastic effects has been made relatively transparent to the user. NASTRAN flutter predictions are validated using field measurements and the effect of aerodynamic damping is demonstrated through an application to the Test Bed VAWT being designed at Sandia.

29665 **(STEV-VIND—85-17) Full-scale experiments at Maglarp. Sub-project: Loads and strains. Sub-report nr 2: Valuation of measurements during October and November 1983.** Ganander, H.; Johansson, H.; Kuehne, K. (Statens Energiverk, Stockholm (Sweden)). Sep 1984. 55p. (In Swedish). (TG—84-06). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751679.

The report presents valuation of strains and dynamic loads at normal working conditions of the wind power plant at Maglarp. The wind speed was max 19.6 m/s. The results are presented in tables, figures and diagrams.

29666 **(STEV-VIND—85-25) Manufacturing of blades WTS 1200.** Nygren, I. (Statens Energiverk, Stockholm (Sweden)). 1984. 30p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751678.

This paper describes the manufacturing process and production control of the blades for the wind power plant WTS 1200. The blades ae made of composite materials.

29667 **(STEV-VIND—85-28) Full-scale experiments at Maglarp. Final report.** Agrell, M. (Statens Energiverk, Stockholm (Sweden)). Mar 1985. 22p. (In Swedish). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751677.

This report is a supplementary final report. It provides details concerning the operation and maintenance of the wind power station at Maglarp for the period 840701-841231.

29668 **(STEV-VIND—85-41) Resonance compensation of wind power plants with variable rotor speed.** Svensson, T. (Statens Energiverk, Stockholm (Sweden)). Nov 1985. 116p. (In Swedish). (FOA-C—20589-E3). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751692.

In a wind power plant with variable rotor speed there is a resonance in the drive train. This report is a comparison between different methods to compensate that resonance. The investigation shows that the best result is obtained if the shaft torque is measured and used for the compensating. If the shaft torque is to be estimated from other signals, an ordinary observer cannot be used since that demands that the system is almost perfectly known. Instead an adaptive regulator can be used but that has not been tested.

20 ELECTRIC POWER ENGINEERING

REFER ALSO TO CITATION(S) 29746

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 29214, 29215, 29216, 29222, 29239, 29240, 29241, 29897

29669 **(CONF-860635—1) Particle and vapor deposition in coal-fired gas turbines.** Ahluwalia, R.K.; Im, K.H.; Chuang, C.F.; Hajduk, J.C. (Argonne National Lab., IL (USA); Missouri Univ., Rolla (USA)). 1985. Contract W-31-109-ENG-38. 39p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86003047.

From 31. international gas turbine conference and exhibit; Dusseldorf, F.R. Germany (8 Jun 1986).

Mechanistic models have been developed for particle and vapor deposition on the blades of coal-fired gas turbines. The particle deposition models include the simultaneous contribution of Brownian and turbulent diffusion, thermophoresis, eddy impaction, and inertial impingement. The diffusive mechanisms have been validated against experimental data for low-speed cascade flow and particle-laden flow through pipes. The inertial deposition treatment is shown to collapse to the well-known expression for particle capture in a flow turning around a bend. A method is presented for calculating Na_2SO_4 and K_2SO_4 vapor deposition on cooled blades. Scaling laws are formulated for estimating the contribution of boundary layer homogeneous and heterogeneous nucleation mechanisms for highly cooled turbine blades. 20 refs., 12 figs.

29670 (CONF-8509154—Summs., pp 44-45) **Utility requirements for battery energy storage and their effects on battery test programs.** Kraemer, K.G.; Kuenisch, H.J. (Berliner Kraft-und Licht (BEWAG) AG, Berlin, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The utilization of energy storage units in electric power supply systems can be divided into the following applications: load coverage, load leveling, instantaneous reserve, and load frequency control. Limits between these applications are vague and unsuitable to define the typical operational stress of a storage device. Additionally, the effects of different modes of operation on various storage types are nonuniform. Utility application of battery storage cannot be judged until more reliable information is available. On the other hand, test methods and procedures can be deduced directly according to the lack of information.

29671 (CONF-8509154—Summs., pp 47-49) **Application testing of batteries for utility load leveling and customer applications at the Battery Energy Storage Test (BEST) Facility.** Pivec, A.; Hyman, E.A.; Radimer, B.M. (Public Service Electric and Gas Co., Newark, NJ). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The demand for electric energy varies hourly, daily, weekly, monthly and seasonally. A study of energy storage performed by Public Service Electric and Gas Company during the last decade concluded that energy storage by electric utilities could yield substantial economic benefits to utilities and customers, and indeed, the world, by shifting a significant amount of present oil use to more abundant fuel resources. In that study, large-scale energy storage in batteries was identified as an important, near-term technology. Test methods and programs for testing and evaluation of battery energy storage systems for utility and customer applications are briefly described.

29672 (CONF-8509154—Summs., pp 167-168) **Battery storage test facility for load frequency control and instantaneous reserve.** Kraemer, K.G. (Berliner Kraft- und Licht (BEWAG) AG, Berlin, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Comprehensive studies showed that electrochemical storage units might be an appropriate means to fulfill load frequency control and instantaneous reserve power requirements. Subsequent studies proved, that an advanced lead-acid battery would be most suitable. Nevertheless, information on the operational behavior of lead-acid batteries and their service life expectancy under load-frequency control stress was not available. Hence, it was decided to carry out a long-term test featuring the operational stress to be found in a full-scale installation. The main objectives were to: determine the battery service life, optimize the operational regime for the storage system, and collect information on system efficiency and availability. The test facility has been operating since July, 1981. The operation of the facility is discussed.

29673 (CONF-8509154—Summs., pp 186-190) **Fundamental studies of utility requirement for secondary batteries - lead-acid batteries.** Nakamura, O.; Higuchi, S.; Okazaki, S.; Takahashi, S. (Government Industrial Research Institute, Osaka, Japan). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Some provisions should be checked when batteries are applied to an electric power storage system. This was investigated by the use of lead-acid batteries. Superimposition of 0.1 Hz to 4000 Hz alternating current upon the dc charge and discharge current had little influence on the battery capacity and cycle life. Observed short circuit currents in some states-of-charge agreed well with the values expected from ohmic resistance measured by the ac impedance method and the dc step method. This should be helpful in designing a safety device against an accidental short circuit in a large scale battery system. A watt-hour at constant power charge should be optimized to the previous discharged watt-hour, corresponding to the conventional ampere-hour at constant current charge. As a step toward this optimization, a linear correlation between charging rates based on watt-hours and ampere-hours was shown at both the constant power and constant current charges.

29674 (EPRI-AP—4431, pp 3.207-3.214) **Overview of EPRI residual fuel oil quality criteria project plan.** Rovesti, W.C. (Electric Power Research Institute, Palo Alto, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

EPRI is planning a multifaceted program to address the problems associated with assessing and specifying the quality of residual fuel oils that are, and expected to be, available for use by utilities in their oil-fired boiler systems. The program is aimed at developing improved criteria and test methodology for determining the quality of this class of liquid fuel, partially through expansion of the fuel property data base using well documented fuel samples.

29675 (ETY—6/1983) **System development of availability statistics on thermal power plants.** Aalto, A.; Keraenen, H.; Poikela, E. (Finnish Energy Economy Association, Helsinki). 1983. 82p. (In Finnish). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751663.

The development study is concentrated on improving the validity, reliability and usefulness of the operating and failure data collected from the Finnish power plants, without increasing the effort needed for the data collection itself. The revision of the computer programs has made it possible to use the stored data as an availability and failure data bank for plants included in the statistics. The revised data collecting will be taken into use in 1983. To get the full use of the newly developed set of computer programs, the raw data collected in 1973-1982 need to be modified to the requirements of the new system. In addition to that the checking, listing and coding of the main components of the participating power plants is deemed necessary.

29676 (ETY—15/85) **Water chemistry control and analytical methods at medium pressure power plants.** Kurkela, S. (Finnish Energy Economy Association, Helsinki). 1985. 103p. (In Finnish). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751670.

The objective of this work has been to draw up a booklet for the production personnel of the steam power plant about the matters related to the maintenance and control of a steam-water circulation. General guidelines can be adapted to the control of a steam-water circulation at steam power plants. For the control of the guidelines it is necessary to have a relevant sampling system, in which the representativeness of a sample does not change, and a sufficient analytical control. The booklet presents the analytical extent of the feedwater treatment for the normal operating conditions at the pressure levels of 35 and 67 bar. It also includes the most important analytical methods for the control of a steam-water circulation. The conservation directions for the downtime of steam boilers have been handled mainly as a principal solution considering low- and medium pressure plants.

29677 (GB—4) **Commercial aspects of CHP and private generation: an Electricity Supply Industry viewpoint.** Budden, R.J.R. (Electricity Council, London (UK)). Mar 1985. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86751893.

The viewpoint of the Electricity Supply Industry is given on commercial aspects of CHP and private electricity generation. Following a history of their development in the UK, the current contribution from private electricity generation in the UK is assessed in 1983 as being 5.8% of the total generated. For industrial CHP, a steady fall in its contribution has occurred since 1973. Reasons for this fall are explained. The use of CHP in district heating is a minor activity due mainly to the relatively low price of domestic gas. However progress with schemes in the cities of Belfast, Edinburgh and Leicester is outlined. Finally, the impact of the 1983 Energy Act on CHP schemes is discussed. (UK).

29678 (ICTIS/M—0188) **Coal power plant in Japan, especially in EPDC's case with advanced combustion and cleaning technique.** Nakabayashi, Y. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 80p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

A detailed account of coal-fired power plants in Japan is given, with emphasis on state-of-the art technologies in the areas of coal combustion, cleaning and emission control. Both existing plants and plants under construction are included in the discussion. The organisation of the Japanese power industry, supply and demand of electric power, environmental regulations, economics and research and development programs into fluidized-bed combustion, ultra super critical pressure plant, air-pollution control technologies and coal water mixture fuels, are covered in depth.

29679 (ICTIS/M—0194) **Combined cycle process with integrated gasification VEW-Coal Conversion Process.** Weinzierl, K. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 19p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

The VEW-Coal Conversion Process is a partial gasification of coal connected to a combined-cycle process. The process is designed for the use of gas in the gas turbine after a partial gasification and gas cleaning. The remaining char is fired in the furnace of the boiler. A partial gasification in an entrained gasifier is chosen for the gas generation from coal. This paper outlines investigations into the design of power plants using these principles. A 10t/h prototype plant is discussed, together with the scale-up technology needed for commercial use. The efficiency and environmental aspects of full-scale operation are considered.

29680 (ICTIS/M—0195) **Cool water Integrated Coal Gasification Combined Cycle project: status and results.** Alpert, S.B.; Wolk, R.H.; Holt, N. (Sydkraft Research Foundation, Malmoe (Sweden)). 1985. 20p. (CONF-8511184—). IEA Coal Research, London, UK.

From Symposium on advanced coal power technology; Malmoe, Sweden (6 Nov 1985).

Economic studies show that Integrated Gasification Combined-Cycle (IGCC) plants have the potential to be cost-competitive with conventional subcritical coal-fired steam plants designed to comply with current federal environmental regulations. IGCC plants have the potential to significantly reduce electricity costs over conventional coal-fired steam plants, and can give higher effective availability due to the modularity of the plants. The Utility Coal Gasification Association was formed in 1982 and comprises about 37 utility companies. EPRI is currently working with 10 of these companies to evaluate the benefits of the phased construction approach to generation expansion planning on specific power systems. Initial results indicate that economic benefits and risk reduction can be achieved by this approach. It is anticipated that IGCC plants will undergo commercial deployment in the 1990's if present demonstration plants prove successful. (8 refs.)

29681 (KTM/E-D—89) **Fouling control in cooling systems using brackish water.** Lietzen, E.; Laihonen, P.; Vuorinen, I. (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1985. 41p. (In Finnish). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751649.

In brackish water circumstances underwater surfaces are usually covered by sessile colony forming aquatic organisms that cause problems e.g. in cooling water systems in industrial plants. Fouling animals cause e.g. pipe corrosion and problems in functioning of cooling systems. Fouling costs in coastal industrial plants are some ten to twenty million Finnish marks yearly. The research work concentrated on macroscopic fouling animals. The main part of the work consisted of experimental testing of different fouling control methods and mapping the distribution and reproductive season of the species in question. The work also comprised the occurrence of fouling detriments in all major coastal plants. The major fouling control methods tested during the research were antifouling paints, raising of cooling water temperature, using fresh water, lack of oxygen, drying and chlorination. Fouling problems are most severe in southern and southwestern coast where salinity is highest. In areas North of Vaasa and East of Loviisa detriments are practically non-existent. The conditions, needs and possibilities in the plants concerned with antifouling practices are various. For this reason planning and execution of preventive methods must be carried out individually in every plant.

29682 (TVA/OP/FHP—86/3) **Tennessee Valley Authority coal inventory procedures and observations.** Smith, S.R. (Tennessee Valley Authority, Chattanooga (USA). Div. of Fossil and Hydro Power). 1 Jun 1983. 25p. NTIS, PC A02/MF A01. File Number DE86901275.

The Tennessee Valley Authority participates in the CIPS Coal Inventory workshop because the TVA burns a lot of coal, more than 30 million tons per year, and because TVA engineers are always looking for ways to reduce the cost of power generated from coal. The accuracy of coal stockpile inventories can made a difference in how much electricity costs, and it is our job to be sure that everyone gets the best deal for their money. The three quantities we are dealing with in inventorying large piles of coal are the delineation of the exposed surface, the base subsidence, and the unit weight, or density. Other considerations are the moisture basis, the quality of the coal, and the financial impact of the difference between the measured and expected values. We will deal with the resoluion of differences between receipt and burn data (scales) and the inventory survey. The instrument foreman tells me we have the best scales money can buy, and his people have calibrated those scales to + or - .25%. In reality there is probably nothing that can happen to a coal pile in between inventories that would add weight. Losses occur from wind, erosion, belt spillage, sampling, and lots of other reasons. At TVA we are never surprised, and have come to expect as normal, a small (less than 2%) loss of coal between inventories. Occasionally we see a gain in weight.

2002 Environmental Control Technology

REFER ALSO TO CITATION(S) 29187, 29195, 29196, 29214, 30204, 30624

29683 (EPRI-AP—4431, pp 3.151-3.169) **Acid smut emission problems associated with Tufts Cove Generating Station.** Covill, I.D. (Nova Scotia Power Corp., Halifax). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

Oil-fired power plants burning heavy fuel oil are experiencing increased production of sulfur trioxide and unburnt carbon that lead to acid smut emission problems. Various parameters discussed for the control of sulfur trioxide formation are burner design, boiler gas tightness, air distribution, air flow regulation, combustion control, and instrumentation. Factors which affect acid deposition are choice of stack temperature, thermal insulation, and stack cleaning. These are all discussed very briefly. Other operational factors influencing the problem are two-shift operation, additives, front- and back-end additives, back-end magnesium hydroxide additive, sootblowing, reversed sootblowing of air heaters, NO/sub x/ contribution to acid fallout, electrostatic precipitation and oil firing, oil burner developments, upgrading existing heavy fuel oil specifications, and boiler cleaning. It is concluded that probably the most practical and economical solution to the problem is to install a back-end magnesium hydroxide additive system coupled with improved combustion efficiency which would include the installation of high swirl, low O_2 burners.

29684 (EPRI-AP—4431, pp 3.173-3.195) **Carbon particulate reduction evaluation for oil-fired utility boilers.** Nylander, J.; McDannel, M.; McDonald, B. (San Diego Gas and Electric, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

An extensive program was undertaken to identify potential sources of and solutions to high emission levels of large (> 50 micrometer) carbon particles from San Diego Gas and Electric (SDG & E) oil-fired boilers. Carbon itself is neither corrosive nor staining, and total particulate emission rates are well below regulatory limits, but carbon has been shown to function as a vehicle typically transporting sulfuric acid that has condensed on the air preheater to ground level. Carbon formation in an oil-fired furnace is controlled by a number of interacting factors, which fall into four general categories: (1) fuel oil properties, (2) fuel oil atomization quality, (3) boiler operation, and (4) boiler design. The impact of these four areas was studied by a combination of pilot-scale combustor tests, atomization spray facility tests, full-scale boiler tests, and design and operation evaluation. In addition, combustion-modifying additives were evaluated in a 320 MW boiler and in a laboratory combustor. Atomization quality and fuel oil properties were identified as potentially the prime contributors to carbon emissions. One combustion-modifying additive was successful at reducing carbon emissions during a full scale boiler trial, and another was successful in combustion tunnel tests. A continuing program is planned to implement solutions developed on several SDG & E boilers. 4 figures, 5 tables.

29685 (EPRI-CS—4404-Vol.1, pp 6.1-6.13) **High-temperature, high-pressure electrostatic precipitation, current status.** Feldman, P.L.; Kumar, K.S. (Research-Cottrell, Inc., Somerville, NJ). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The development of the technologies of pressurized fluidized bed combustion and coal gasification brings new challenges to particulate control technology. Removal of particulate from gas streams at conditions of high temperature and high pressure requires a reevaluation of the criteria for choosing and sizing particulate control equipment. This paper presents the theory of electro-

static precipitation as it applies to the special case of high temperature and high pressure. The effects of temperature and gas density on electrical energization and particle migration are discussed and conclusions are drawn concerning the viability of electrostatic precipitation and its comparison to other control methods. Precipitator design considerations and previous precipitator experience at conditions of high temperature and high pressure are also presented. 6 references, 2 figures, 1 table.

29686 (EPRI-CS—4404-Vol.1, pp 7.1-7.14) **Test results of a precipitator operating at high-temperature and high-pressure conditions.** Rugg, D.E.; Rinard, G.; Durham, M.; Armstrong, J. (Denver Research Institute, CO). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The results of pilot scale tests on an ESP operating at Pressurized Fluidized Bed Combustor (PFBC) conditions are presented. The tests wee performed at the Denver Research Institute's Hot Gas Test Facility in Denver, Colorado at a constant flow rate of 0.056 m^3/sec (118 acfm) on a single tube cylindrical ESP with an SCA of 36 sec/m (183 ft^2/kacfm). Dust conditions were simulated by reentrainment of fly ash obtained from the Curtiss-Wright Small Gas turbine Test Rig, and mass collection efficiencies were determined by simultaneous inlet and outlet dust concentration measurements. Tests were performed for different corona electrode designs, at temperatures of 760° and 900°C (1400° and 1650°F), and pressures of 6.4 and 10 atm. The effect of the parameters on collection efficiency is discussed. While no signs of thermal ionization were apparent at even the highest temperature, the addition of fly ash did cause an unexpected increase in corona current. The importance of the design on the corona electrode in determining a practical operating region is discussed. The results are important, for hot gas cleanup not only for combined cycle PFBC applications, but also for turbo-charged PFBC systems and coal gasifiers.

29687 (EPRI-CS—4404-Vol.1, pp 8.1-8.15) **Evaluation and development of candidate high temperature filter devices for pressurized fluidized bed combustion.** Lippert, T.E.; Ciliberti, D.F.; Drenker, S.G.; Tassicker, O.J. (Westinghouse Electric Corp., Pittsburgh, PA). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The Electric Power Research Institute (EPRI) and Department of Energy (DOE) have sponsored work at Westinghouse to evaluate and develop particle filtration technology for Pressurized Fluidized Bed Combustion (PFBC). This work has included testing granular beds woven ceramic bag and two different rigid porous ceramic filters, the ceramic candle and ceramic cross-flow filter. The cross-flow filter has also been tested at the Argonne National Laboratory on the effluent from a small PFBC combustor. Results of test work on these candidate devices are summarized. To date no filter device has been demonstrated for PFBC. The woven ceramic bag filters appear attractive for early PFBC demonstration because of their potential for easy cleaning and high performance and have been tested at a filter size that should be easily scaleable to pilot operation. The porous ceramic candle and cross flow filters are attractive candidates because of their high performance characteristics and the ability to operate these filters over a wide range of conditions. The cleanability of these filters over a long term basis and methods for mechanical support are uncertainties that need to be evaluated and demonstrated to minimize risk in pilot plant operation. The shallow, granular bed filter (GBF) system originally under development by Ducon for lower temperature industrial application has been modified for PFBC. The revised design has been successfully tested on a bench scale, single bed configuration. Further work is needed to optimize bed media selection and cleaning cycle. 8 figures, 6 tables.

29688 (EPRI-CS—4404-Vol.1, pp 10.1-10.15) **Development and high temperature application of a novel method for measuring ash deposits and cake removal on filter bags.** Ciliberti, D.R.; Lippert, T.E.; Tassicker, O.J.; Drenker, S. (Westinghouse Electric Corp., Pittsburgh, PA). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper presents theoretical development and experimental confirmation of a novel capacitance based measurement technique for the on-line determination of dust cake build-up and removal, on pulse jet cleaned bag filters. Ambient testing results indicate that a resolution of approximately 0.05 kg/m^3 is easily attainable with the transducer. The method has been applied to filtration at ambient conditions and extended to operation at temperatures in excess of 800°C and at pressures at 11 atm. This method has been further expanded to allow axial resolution of dust cake deposits along the bag and has allowed a better understanding of the mechanics involved in dust cake release and subsequent build-up. 6 figures.

29689 (EPRI-CS—4404-Vol.1, pp 11.1-11.18) **Economics of electrostatic precipitators and fabric filters.** Belba, V.; Horney, F.A.; Carr, R.C.; Piulle, W. (Stearns Catalytic Corp., Denver, CO). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper presents the relative economics of fabric filter (FF) and precipitator (ESP) systems for utility boilers firing fuel from five (5) major coal fields and meeting a range of particulate emission limitations. For example, to meet the current NSPS of 0.03 lb/MMBtu, ESPs and FFs were found to be economically equivalent for the more precipitable ash from high to medium sulfur eastern coals and North Dakota lignites. The FF is the economic choice for the low sulfur western coals investigated in this paper. This paper also examines the cost benefits of optimizing FF and ESP designs. For example, the levelized costs of a conventional reverse gas FF can be reduced by increasing the air-to-cloth ratio above the more conventional design of 2.0 ft/min. Other technologies investigated are shake/deflate and sonic horn cleaning of FFs and gas conditioned ESPs. The sensitivity of a particulate collection system's cost estimate to such factors as air-to-cloth ratios, bag life and power consumption is demonstrated. 10 references, 12 figures, 5 tables.

29690 (EPRI-CS—4404-Vol.1, pp 12.1-12.9) **Estimating the benefits of SO_3 gas conditioning on the performance of utility precipitators when burning US coals.** Gelfand, P. (P. Gelfand Associates, Trumbull, CT). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

SO_3 gas conditioning is frequently considered as a means of upgrading the performance of existing ESPs and for some new installations to reduce overall equipment size and cost. This paper considers the potential benefits SO_3 may have on existing utility ESPs burning coals from the major coal producing regions of the US. Criteria are developed for identifying SO_3 candidate installations, and using the Matts-Ohnfeldt precipitation model, relevant exponents, migration velocities and enhancement factors attainable with SO_3 conditioning are estimated. The results are then compared to existing installations. 3 references, 1 figure, 1 table.

29691 (EPRI-CS—4404-Vol.1, pp 13.1-13.7) **Microcomputer models for particulate control.** Viner, A.S.; Ensor, D.S.; Sparks, L.E. Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The phenomenal growth of the microcomputer industry has made it possible for almost anyone in industry to have a relatively

fast and easy-to-use computer at their disposal. Unfortunately, the specialized software needs of the air pollution community have not been met. In an attempt to address this need, the Research Triangle Institute, under contract to the US Environmental Protection Agency, has developed a set of programs especially for air pollution related problems. In this paper the authors describe microcomputer models of electrostatic precipitator performance, an implementation of the GCA/EPA baghouse model, an in-stack opacity prediction program, and a plume opacity model. The theoretical models for each program are briefly described, followed by a description of their utility to the air pollution community. Plans for making the programs widely available are also discussed. 6 references.

29692 (EPRI-CS—4404-Vol.1, pp 14.1-14.15) **Impact of proposed acid rain legislation on power plant particulate control equipment.** Cole, W.H. (Gibbs and Hill, Inc., New York, NY). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

It is possible that some form of acid rain legislation will be enacted in the near future although the initial phase may be limited to an accelerated research and development program. If sulfur dioxide control measures are required for selected plants not so equipped, the impact on particulate control equipment could range from the use of coal washing, limestone injection into the boiler, a switch to low sulfur coal, or the use of flue gas scrubber systems. The applicability of these alternatives is examined for several levels of legislation, with approximate costs for a 500 Mw unit. These levels range from a 40% reduction in present emission, to the most stringent requirement of the New Source Performance Standards. The effects on the performance of particulate control equipment are examined, with cost estimates for remedial measures where required. 3 references, 9 tables.

29693 (EPRI-CS—4404-Vol.1, pp 15.1-15.16) **Particle charging with an electron beam precharger.** Clements, J.S.; Mizuno, A.; Davis, R.H. (Florida State Univ., Tallahassee). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The charging performance of both high and low energy electron beam prechargers has been evaluated for the bi-electrode and tri-electrode geometries. The effects of electron beam energy, beam current, electric field strength, current density, and exposure time on charging efficiency were investigated by measuring the charge acquired by large conducting spheres and 1 and 3 μm diameter PSL particles. The performance of the high energy precharger was unsatisfactory because the energetic scattered electrons created positive ions in the negative charging region which degraded the charging performance. In the low energy electron beam precharger measurements, the beam energy was adjusted so that the ionization zone (bipolar region of ionized air) was smaller than the electrode spacing. This avoids spurious ionization by scattered electrons and establishes a monopolar charging region due to the separation of the bipolar ions by the electric field. Particle charges greater than 5 times the theoretical ionic charging value were observed using the low energy bi-electrode precharger. The increased charge may be caused by space-charge enhancement of the electric field and/or free electron charging. 13 references, 9 figures.

29694 (EPRI-CS—4404-Vol.1, pp 16.1-16.12) **Charging of particulates by evaporating charged water droplets.** Castle, G.S.P.; Inculet, I.I.; Littlewood, R. (Univ. of Western Ontario, London). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The paper describes experiments which show the feasibility of charging aerosols by injecting fast evaporating charged water droplets. The charged water droplets having charge to mass ratios in excess of 50 microcoulomb per gram are produced by combined ultrasonic atomization and conduction charging. Laboratory tests show the effectiveness of charging in a modified two stage electrostatic precipitator system. Potential applications of the new system are presented. 10 references, 6 figures, 2 tables.

29695 (EPRI-CS—4404-Vol.1, pp 18.1-18.10) **Hot-gas fabric filtration 500°F-1500°F - no Utopia but reality.** Bergmann, L. (Filter Media Consulting, Inc., LaGrange, GA). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Not fully recognized is the feasibility of cleaning and controlling particulates at temperatures above 500°F. The availability of filter media that can withstand very high temperatures (between 500°F-2000°F) has opened completely new technical possibilities to design filter systems and to control particulates. Energy is the major driving force to acceptance of the potential market for hot-gas filtration. Since high temperature of processing of materials directly effects the cost structure of manufacturing, there are many advantages of hot-gas fabric filtration. The electricity cost in 1950 represented 18% of total manufacturing cost, which raised in 1980 to 32%. It is expected in the year 2000 to represent 45%, the single largest cost factor, larger than wages and raw materials. A common procedure is to cool gases so they can be treated in conventional fabric filters below 500°F. On the other hand, hot gases can be filtered with a maximum of energy by direct heat exchanging or by using them for preheating of process materials. Cooling and heat exchanging or by using them for preheating of process materials. Cooling and heat exchange equipment is prone to corrosion. Working under hot-gas conditions, however, reduces chances to run through the acid dew point and damage equipment or possibly destroy filter materials. There has been an increasing search for possibilities to recover heat from loaded hot industrial gases in a simpler manner. 2 figures, 2 tables.

29696 (EPRI-CS—4404-Vol.2, pp 1.1-1.15) **Microcomputer programs for precipitator performance estimates.** Faulkner, M.G.; DuBard, J.L.; Dahlin, R.S.; Sparks, L.E. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The EPA/SRI mathematical model of electrostatic precipitation has been coded in FORTRAN for the Radio Shack TRS-80 Model III or 4 microcomputer. The TRS-80 model retains all essential features of the main-frame computer model, but omits several user options. The precipitator simulation is divided into four separate programs: a simplified data entry menu, a choice of a rigorous computation of ideal collection efficiency or a rapid estimation procedure, and approximate corrections for non-ideal gas flow and rapping reentrainment. A supplementary program can be used to estimate the electrical operating points that are required for the precipitator simulation. Given values of fly ash resistivity and precipitator plate spacing, this program estimates the electrical operating points by using average data from cold-side utility fly ash precipitators. Another supplementary program can be used to compute the plume opacity, given an optical path length and the particulate emissions computed by the precipitator simulation. All six microcomputer programs are included in Revision III of the main-frame computer model. 13 references, 5 figures, 6 tables.

29697 (EPRI-CS—4404-Vol.2, pp 2.1-2.15) **Analysis of error in precipitator performance estimates.** DuBard, J.L.; Altman, R.F. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The EPA/SRI mathematical model of electrostatic precipitation has been analyzed for the propagation of error in estimated input data and for the agreement between measured and computed collection efficiency, using both measured and estimated input data.

The estimated aerosol data and electrical data are based on measurements performed at 33 utility boilers and 13 utility fly ash precipitators. The numerical parameters used to make approximate corrections for non-ideal gas flow are based on a comparison of 18 sets of measured and computed efficiency, obtained for precipitators of SCA from 135 to 745 ft²/kACFM. Numerical confidence intervals in the efficiency computed using estimated input data are established for four test cases with fly ash resistivity of 5E10 and 1E12 ohm-cm and SCA of 250 and 500 ft²/kACFM. In each case, the lower 90% confidence margin in computed collection efficiency requires an increase in SCA of approximately 125 ft²/kACFM to attain the nominal collection efficiency. 3 references, 16 figures, 4 tables.

29698 (EPRI-CS—4404-Vol.2, pp 3.1-3.15) **Use of a mobile electrostatic precipitator for pilot studies.** Crynack, R.R.; Sherow, J.D. (Wheelabrator Air Pollution Control, Coraopolis, PA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper describes the use of a mobile electrostatic precipitator for pilot studies. The advantages and disadvantages of using and operating a pilot ESP are reviewed along with cost estimates. The paper includes a description and the features of the mobile ESP, which include variable plate spacing, three field operation, tapped transformers and reactors, automatic controls, and the ability to quickly change electrodes. Four case studies using the mobile ESP are discussed. The first study was to determine the scale factor between the pilot unit and a cold side, full scale unit and to compare the performance of various electrode configurations. The second study was to obtain performance data on a new fuel, solvent refined coal. The third study was the application of an ESP following a spray dryer operating under various conditions. 3 references, 3 figures, 11 tables.

29699 (EPRI-CS—4404-Vol.2, pp 4.1-4.14) **Prediction of voltage-current curves for novel electrodes arbitrary wire electrodes on axis.** Lawless, P.A.; Sparks, L.E. (Research Triangle Institute, Research Triangle Park, NC). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Theoretical prediction of voltage-current characteristics for ESPs has been limited to single wires or infinite arrays of wires in the wire-plate geometry. As part of a program investigating the prediction for arbitrarily arranged electrodes, a model for wire electrodes has been developed that accurately predicts starting voltages and V-I curves for finite numbers of wires of mixed diameters and spacings. This model is implemented on a microcomputer, providing an interactive approach for investigating electrode arrangements. The accuracy of the model is demonstrated, and some of the implications for operating ESPs are explored. 11 references, 3 figures, 1 table.

29700 (EPRI-CS—4404-Vol.2, pp 5.1-5.17) **Numerical computation of the electrical conditions in a wire-plate electrostatic precipitator using the finite element technique.** Kallio, G.A.; Stock, D.E. (Washington State Univ., Pullman). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The calculation of electrical conditions inside electrostatic precipitators is integral in the development of performance models and design of hardware. Specifically, accurate knowledge of the electric field strength and space charge density is needed to evaluate such processes as particle charging, coulombic drift, electric wind, and back corona. In the present paper, electrical conditions in a wire-plate ESP are computed by utilizing the finite element method to solve the governing electrostatic equations. This method offers distinct advantages in this geometry over conventional finite difference numerical techniques: (i) nodal spacing can be selectively adjusted over the solution domain to optimize computational accuracy and economy; (ii) curved boundaries are easily and accurately accommodated; (iii) internodal solutions can be readily evaluated. The solution yields voltage-current characteristics in addition to space charge density, electric potential, and electric field distributions. The results are compared to finite difference solutions and existing experimental data. 10 references, 7 figures.

29701 (EPRI-CS—4404-Vol.2, pp 6.1-6.16) **Field study of a combined NH_3-SO_3 conditioning system on a cold-side fly ash precipitator at a coal-fired power plant.** Dahlin, R.S.; Gooch, J.P.; Marchant, G.H. Jr.; Bickelhaupt, R.E.; Sears, D.R.; Altman, R.F. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2). Contract AC18-80FC10225.

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper presents the results of a field study of a combined NH_3-SO_3 conditioning system used to improve the performance of a cold-side electrostatic precipitator at a coal-fired power plant. The NH_3 was injected between the air heater and the precipitator at a rate of 5 ppm, and the SO_3 was injected ahead of the air heater at a rate of 9 ppm (in addition to 5 ppm of SO_3 produced naturally in the boiler). The measured concentrations of NH_3 and SO_3 just ahead of the precipitator were below 0.5 ppm, suggesting that the two agents were adsorbed on the fly ash and/or reacted together to form a sulfate particulate. Laboratory studies showed that the adsorption of these quantities of NH_3 and SO_3 on the ash produced a surface film that reduced the electrical resistivity of the ash by about one order of magnitude. The reduced resistivity was directly responsible for the excellent electrical operating conditions of the precipitator, which made it possible to achieve a collection efficiency of 98.5% with an SCA of only 166 ft²/kacfm. 11 references, 6 figures, 2 tables.

29702 (EPRI-CS—4404-Vol.2, pp 7.1-7.13) **Conditioning of power station flue gases to improve electrostatic precipitator efficiency.** Mayer-Schwinning, G.; Riley, J.D. (Lurgi GmbH, Frankfurt, West Germany). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Adverse collection conditions in electrostatic precipitators for cleaning flue gases from power stations can be improved by conditioning the flue gas. In many cases it is possible to lower the emission values from old plants or operate new plants at maximum efficiency. This paper describes conditioning by the addition of SO_3 and conditioning with water in an evaporation cooler, the latter applied by Lurgi in a power station for the first time. 10 figures.

29703 (EPRI-CS—4404-Vol.2, pp 8.1-8.15) **Pilot-scale study of a new method of flue-gas conditioning with ammonium sulfate.** Dismukes, E.B.; Landham, E.C. Jr.; Gooch, J.P.; Altman, R.F. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A new process for flue-gas conditioning with ammonium sulfate was investigated on a pilot scale at EPRI's Arapahoe Test Facility. The agent is decomposed to ammonia and sulfur trioxide in a hot gas slipstream to simulate bypassing the air heater in a full-scale plant. The process thus avoids loss of sulfur trioxide (the effective chemical species) and corresponding plugging of the air heater, which occur when the agent is decomposed conventionally in the main flue-gas stream ahead of the air heater. Chemical aspects of the decomposition process were characterized on the pilot scale and compared with earlier laboratory data. Lowering of the electrical resistivity of ash from low-sulfur coal was demonstrated by (1) direct measurements of reduced resistivity in situ and (2) observations of electrical manifestations of suppressed back corona in an ESP. Comparable improvements in ash collection efficiency in the ESP, from about 98.6 to 99.6%, were observed with sulfur trioxide

obtained by the decomposition of ammonium sulfate or by the vaporization of liquid sulfur trioxide. 11 references, 3 figures, 7 tables.

29704 (EPRI-CS—4404-Vol.2, pp 9.1-9.14) **Power plant plume opacity control.** Hughes, J.M.; Lee, K.T. (Virginia Polytechnic Institute and State Univ., Blacksburg). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Achieving compliance with plume opacity standards remains a significant problem in the electric utility industry. Even modern plants equipped with electrostatic precipitators and scrubbers emit plumes that do not comply with standards for visible emissions. The conversion in the presence of catalysts, of sulfur containing flue gases to sulfate aerosols is the major source of the problem. This paper deals with the control of plant operating parameters and the application of control equipment and/or chemical additives to bring about plume opacity compliance. In achieving compliance with opacity standards a reduction in plant particulate emissions will be achieved by the fact that particulate formation in the plume will be reduced. 24 references, 6 tables.

29705 (EPRI-CS—4404-Vol.2, pp 10.1-10.15) **Pulse energization system of electrostatic precipitator for retrofitting application.** Masuda, S.; Hosokawa, S. (Univ. of Tokyo, Japan). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A cassette type pulser module has been developed for electrostatic precipitators for upgrading the performance of existing plants. The module is to be inserted between the existing dc power supply and corona electrodes. No coupling means like a pulse transformer or a coupling condenser are used. A saw-teeth voltage appears on the corona electrodes at a desired frequency, which includes at its leading edge a transient LC oscillation with its very sharp first peak and its amplitude decaying rapidly. The first peak behaves as a submicrosecond pulse and produces very active negative streamers uniformly distributed along the entire length of existing corona wires of the conventional construction. The average of the saw-teeth voltage produces a dc collection field between the corona and the collecting electrodes. This direct-coupled pulse energization indicated in laboratory tests exactly the same collection performance as the most effective submicrosecond pulse energization using a coupling capacitor and a dc bias voltage. A specific feature of the present pulse energization system is its simplicity in construction and low initial and operating costs. 5 references, 14 figures, 2 tables.

29706 (EPRI-CS—4404-Vol.2, pp 11.1-11.17) **Practical implications of pulse energization of electrostatic precipitators.** Milde, H.; Ottesen, J.; Salisbury, C. (Ion Physics Co., Burlington, MA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

In a conventional electrostatic precipitator an applied dc voltage produces negative ions, charges particles and provides the electrical field needed to transport particles to collecting plates. In the case of high resistivity dust or fly ash, high dc voltages at the collecting plate produce positive ions in a back corona discharge. This positive current effectively reduces the negative charge on particles which reduces collecting efficiency. Pulse energization, which consists of superimposing narrow high voltage pulses onto a base dc voltage offers a way to improve collection efficiencies. Independent control of pulse amplitude and pulse frequency allows for separate control of negative ion generation and charging on the one hand and particle transport fields on the other. Techniques for applying pulses and the pragmatic significance of pulse energization are discussed along with benefits such as increased collection efficiency at low SCA and improved control. Operating results and cost data from coal-fired boiler installations are presented. 19 references, 5 figures, 2 tables.

29707 (EPRI-CS—4404-Vol.2, pp 12.1-12.21) **Laboratory and full-scale characteristics of electrostatic precipitators with rigid mast electrodes.** Krigmont, H.; Allan, R.; Triscori, R.; Spencer, H.W. III. (Joy Industrial Equipment Co., Los Angeles, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

There was an increase in development activities on rigid discharge electrodes in the mid-seventies. Since that time, JOY Manufacturing Company has carried out tests on a patented rigid mast electrode in the laboratory and on full-scale retrofitted and new units. JOY's mast electrodes are now in operation in 29 units around the world. The use of this electrode has improved precipitator reliability while maintaining particulate performance equal to or greater than that of conventional weighted-wire designs. This paper describes the electrode and its characteristics in various applications. 6 references, 11 figures, 3 tables.

29708 (EPRI-CS—4404-Vol.2, pp 13.1-13.21) **Full scale experience with pulsed energization of electrostatic precipitators.** Porle, K.; Bradburn, K. (Flakt Industri AB, Vaxjo, Sweden). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

One of the most promising new technologies for electrostatic precipitators is pulsed energization. Extensive research and development during the last 10 years has introduced several different concepts. Reduced outlet emissions have up to now been emphasized but research by Flakt shows that remarkable power savings can be obtained by using suitable pulse concepts. This paper presents test results from full-scale installations where up to 90% of the power has been saved in combination with reduced emission compared to conventionally energized ESP's. Two different technologies have been used. A special T/R-set has been developed for the multiple pulse charging concept where thyristors are incorporated in the high voltage circuit thus avoiding any pulse transformer. Low energy losses are obtained and the pulse widths are in the microsecond range. The semi pulse charging concept uses modified conventional T/R-set controls and produces pulse widths in the millisecond range. Plants with both technologies are today in operation worldwide and the equipment has shown excellent reliability and availability. 7 references, 14 figures.

29709 (EPRI-CS—4404-Vol.2, pp 14.1-14.16) **New life for old weighted wire precipitators: rebuilding with rigid electrodes.** Aa, P.J.; Gawreluk, G.R. (Research-Cottrell, Inc., Somerville, NJ). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

There are thousands of weighted wire precipitators currently operating in the US. Most of these units were designed in the 50's, 60's and early 70's. Since that time pollution control requirements have become more stringent and electrostatic precipitator technology has advanced considerably. This paper discusses how vintage weighted wire precipitators may be upgraded to state-of-the-art rigid electrode designs while improving performance, enhancing reliability and avoiding costly equipment replacement. Three case histories are examined where rigid electrode upgrades have been undertaken. They include a black liquor recovery boiler; an industrial power boiler; and a major utility generating station. Special attention is paid to major design modifications made and final operating results. Also discussed are modifications made to electrical control equipment in order to improve performance and reliability. 4 references, 7 figures, 7 tables.

29710 (EPRI-CS—4404-Vol.2, pp 15.1-15.4) **Pulsing on a cold-side precipitator: Florida Power Corporation, Crystal River, Unit 1.** Niemeyer, J.W.; Wright, R.A.; Love, W. (Lucidyne, Inc., San Diego, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Lucidyne, Inc. and Florida Power Corporation conducted a pulser feasibility study on the Unit 1 precipitator at Crystal River Station. The test was to demonstrate pulsing as a viable means of enhancing precipitator performance. Unit 1 Crystal River precipitator is a cold-side Buell design which was expected to operate below specification due to switching to low sulfur coal. Testing was done in one outermost cell of six cells across gas flow. Lucidyne's pulsers were installed on the first five fields in the direction of gas flow, the third field was grounded, reducing the number of pulsers to four in series. Testing unpulsed with one field shorted resulted in an efficiency of 96.7%. Adjusting for power level and plate area provided an unpulsed base efficiency of 98.1%. One pulser produced an enhancement factor = 1.09. Two pulsers produced an enhancement factor = 1.22. Three pulsers produced an enhancement factor of 1.26. However, four pulsers in series did not provide significant improvement.

29711 (EPRI-CS—4404-Vol.2, pp 16.1-16.13) **Field study of multi-stage electrostatic precipitators.** Durham, M.; Rinard, G.; Rugg, D.; Carney, T.; Armstrong, J.; Sparks, L. (Denver Research Institute, CO). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A multi-stage electrostatic precipitator (ESP) utilizes a configuration of charging and collecting devices to provide optimum performance for a particular set of operating conditions. Each component of the ESP can then be designed to cope with the dust loading, particle size distribution, and dust resistivity encountered. This technology is applicable for improving ESP collection of fine, high resistivity dust from such sources as low sulfur power plant flue gas, cement kilns, and metallurgical processes. This paper describes the results to date of field tests on a multi-stage ESP at the EPA/DRI Valmont Electrostatic Precipitator Test Facility in Boulder, Colorado. The ESP utilizes alternate stages of Temperature-Controlled Electrode Prechargers (TCEP) and parallel plate collectors. The precharger consists of corona wires suspended between anodes that are cooled by 38-43°C (100-110°F) water which reduces the resistivity of the dust collected in the precharger, allowing operation at very high field strengths, greater than 5 kV/cm. The mean flue gas temperature is reduced by only 1.7°C (3°F) by the precharger. Tests were performed using different combinations of chargers and collectors. Collection efficiencies as high as 99.4% were obtained on an ESP with an SCA of 46 s/m (235 ft²/1000 acfm). However, the collector sections experienced problems with non-rapping reentrainment, requiring operation at a velocity below 1 m/s (3 ft/s). The results are summarized and discussed in terms of further application of the precharger as a retrofit device on conventional ESPs. 8 references, 2 figures, 2 tables.

29712 (EPRI-CS—4404-Vol.2, pp 17.1-17.12) **Optimizing the collector sections of multi-stage electrostatic precipitators.** Rinard, G.; Durham, M.; Rugg, D.; Sparks, L. (Denver Research Institute, CO). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A companion paper, Field Study of Multi-Stage Electrostatic Precipitators, describes tests of parallel plate-plate collectors in multi-stage ESPs. The tests described in that paper showed that with this configuration the gas velocity must be reduced to avoid excessive non-rapping reentrainment. The present paper describes further tests that were performed at EPA laboratories in Research Triangle Park, North Carolina, utilizing conventional wire plate collectors in a multi-stage ESP. The ESP had cooled pipe chargers and conventional collectors in alternating sections. Both conventional and pulsed excitation were performed utilizing 0.32 and 0.95 cm (1/8- and 3/8-in.) diameter rod electrodes. The results indicate that good collection efficiencies are possible in a multi-stage ESP, with high resistivity dust using conventional wire plate collectors. A particularly important application is for retrofitting an existing ESP on power plants utilizing coal switching, dry scrubbers, or the LIMB process to reduce sulfur emissions. In these cases the higher grain loading and higher dust resistivity produced by the sorbent material may cause a conventional ESP to no longer meet compliance. The use of the multi-stage technology can potentially improve the cost effectiveness of these strategies for mitigating acid precipitation caused by power plant sulfur emissions. 2 references, 4 figures, 3 tables.

29713 (EPRI-CS—4404-Vol.2, pp 18.1-18.14) **Ceramic-made boxer-charger for precharging applications.** Masuda, S.; Hosokawa, S.; Kaneko, S. (Univ. of Tokyo, Japan). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A Boxer-Charger comprising ceramic-made, high-performance, and compact-size ionizer units has been developed for back corona free precharging of high resistivity dust in electrostatic precipitation and electrostatic augmentation of fabric filters. The ionizer units consist of high purity alumina plates with tungsten corona electrodes on their surface and a tungsten-film induction electrode embedded inside the plates (IS-panel ; ion source panel). A sharp pulse voltage with 200 - 500 ns duration time and -4 - -7 kV peak voltage produces very active surface streamers on the ceramic plates as an active plane-like ion source. The cost of a power supply for ion generation is greatly reduced owing to a reduced pulse voltage required, and yet a very satisfactory charging performance can be obtained. The basic characteristics of ion generation and charging efficiency are confirmed to be very satisfactory for precharging applications. Tests are made in a laboratory precipitator with high resistivity fly ash with up to 1.4×10^{13} ohm-cm resistivity. Their performance enhancement is especially remarkable in the two stage type precipitator when the ceramic-made Boxer-Charger is combined with the pulse-energized collection fields where no back corona takes place in the collection fields up to 2×10^{13} ohm-cm. 8 references, 12 figures, 3 tables.

29714 (EPRI-CS—4404-Vol.2, pp 19.1-19.15) **Precipitator performance enhancement with pulsed energization.** Landham, E.C. Jr.; DuBard, J.L.; Piulle, W.; Sparks, L.E. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Research type pulsers were installed on each of three electrical fields of the EPRI pilot-scale precipitator at the Arapahoe Test Facility. Either fast risetime (1.5 μs) pulses or longer duration (140 μs) pulses of -25 kV amplitude could be superimposed on -50 kVDC at variable repetition rate up to 200 Hz. The precipitator collection efficiency, with and without pulsing during a single day, was measured on 35 days over a period of 3 months at both 9-inch and 12-inch plate spacing. The fly ash resistivity was varied in the range of 5E10 to 5E12 ohm-cm. Omega-k enhancement factors for fly ash precipitators of SCA from 150 to 400 ft²/kACFM, both full-scale and pilot-scale, correlate more closely with the baseline collection efficiency than with fly ash resistivity. 5 references, 11 figures, 2 tables.

29715 (EPRI-CS—4404-Vol.2, pp 20.1-20.15) **Aerosol particle charging in a pulsed corona discharge.** DuBard, J.L.; Piulle, W.R. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The charge acquired by individual aerosol particles, in both steady and pulsed negative corona, has been measured with a Millikan cell. Measurements have been performed on a pilot-scale fly ash precipitator and a wire-cylinder laboratory precipitator. The

laboratory experiments were designed to isolate the particle charging mechanism from other electrical mechanisms that might be affected by pulse energization. The laboratory data were compared with particle charging computations, using a numerical simulation of the variations in space and time of the electric field and ion density. The laboratory field and ion density occur too briefly for particle charging to be a dominant mechanism of precipitator performance improvement. During tests of the pilot-scale precipitator with pulse energization, omega-k enhancements of 1.7 to 1.9 were observed when the Millikan data showed no increase in fine particle charge. 6 references, 14 figures, 1 table.

29716 (EPRI-CS—4404-Vol.2, pp 21.1-21.16) **Performance of large-diameter wires as discharge electrodes in electrostatic precipitators.** Bush, D.V.; Pontius, D.H.; Sparks, L.E. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Conventional practice in the design of corona discharge electrodes for electrostatic precipitators (ESP's) tends toward those having a relatively low corona inception voltage. The theory indicates that maximal electric field strength is of more importance to the precipitation process than is corona current, since it is beneficial to both charging and collection of particles. Only those particles smaller than about 0.2 micrometer diameter are more readily charged by increasing the ion current density instead of the electric field strength. Laboratory tests of a small pilot ESP (1000 acfm*) and field tests of a large pilot system (30,000 acfm) comparing the performance of 3/8-inch diameter wires with more nearly conventional 1/8-inch wires have borne out the theory and resulted in substantially superior performance for the larger electrodes. 6 references, 7 figures, 3 tables.

29717 (EPRI-CS—4404-Vol.2, pp 22.1-22.13) **Technical evaluation of plate spacing effects on fly ash collection in precipitators.** Altman, R.F.; Driggers, G.W.; Gray, R.W.; DuBard, J.L.; Landham, E.C. Jr. (Electric Power Research Institute, Chattanooga, TN). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A joint program between EPRI and C-E is being conducted to evaluate the effects of increasing plate spacing and applied voltage in precipitators collecting coal combustion fly ash. Plate spacings will range from nine (9) inches to twenty-two (22) inches during the experimental program being conducted at the EPRI Arapahoe facility pilot plant. Spacings up to 31.5 inches (800 mm) have been reported on non-fly ash applications and up to 15.7 inches (400 mm) on coal fly ash outside the US with apparent success. This is first major experimental program in the US to systematically examine the effects on collection efficiency of various plate spacings, applied voltages, and fly ash resistivities. Total mass and fractional collection efficiencies will be measured under the various operating conditions, and these data will be examined by various analytical techniques to determine the best approach for comparing performance under the varying conditions and to facilitate scale-up to full size precipitators. 7 references, 5 figures, 2 tables.

29718 (EPRI-CS—4404-Vol.2, pp 23.1-23.11) **Electrical characteristics of large-diameter discharge electrodes in electrostatic precipitators.** McLean, K.J.; Sparks, L.E. (Univ. of Wollongong, Australia). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Some of the electrical characteristics are discussed that arise in an electrostatic precipitator with large-diameter discharge electrodes collecting high resistivity fly ash. These electrodes are effective because, once they are contaminated, corona current flows at voltages well below that which conventional theory predicts. The voltage level however is greater than that of the conventionally sized electrodes, and this produces higher charging and collecting electric fields. The individual tuft discharges that produce this corona current are randomly distributed along the discharge electrode, are often unstable, and produce areas of high current density which can easily charge a particle to saturation. The instability and distribution of these tuft discharges affect the formation of back corona and reduce its deleterious effects. The optimum diameter is about 9.5 mm [3/8-in.] for the test condition. 3 references, 4 figures.

29719 (EPRI-CS—4404-Vol.2, pp 24.1-24.17) **Laboratory analysis of corona discharge electrodes and back corona phenomena.** Bush, P.V.; Snyder, T.R. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

An experimental research program was conducted to characterize corona and back corona generation with different geometries in various environments. A wire-parallel plate device and a wire-cylinder apparatus were utilized to monitor the spatial distribution and temporal stability of corona and back corona discharges. Conditions that were varied in the experiments included temperature, diameter of corona electrode wire, corona polarity, and type of corona electrode (smooth versus barbed) and its condition (rough versus polished). Back corona discharges were induced by depositing fly ash on the grounded electrode. Visual observations of corona and back corona phenomena were made with a sensitive video camera. The measured distributions of corona and back corona current and statistical analyses allow a quantitative assessment of the impact of corona electrode design on electrostatic precipitator performance. This paper describes the laboratory apparatus and gives a survey of experimental results. A discussion of the implications of this study for new and retrofit ESP design completes the scope of this paper. 5 references, 13 figures.

29720 (EPRI-CS—4404-Vol.2, pp 25.1-25.15) **Onset of electrical breakdown in dust layers.** Young, R.P.; DuBard, J.L.; Sparks, L.E. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The onset of electrical breakdown in 0.5 cm thick layers of fly ash and cement dust has been determined by slowly increasing the applied voltage and observing the oscilloscope trace of the first microspark in the dust layer. The electrical properties of the sample are not altered by this sensitive measurement technique; so multiple experiments can be performed on each sample. Parallel plate electrode geometry is used to define precisely the average electric field in the sample and to permit conventional measurements of the sample resistivity, in addition to the novel measurements of the breakdown voltage, with variations in sample temperature and environmental water vapor. The measured breakdown voltage is systematically influenced by the water vapor concentration, in the temperature region of particle surface conduction, and by the particle size distribution and packing density of the sample. 12 references, 14 figures.

29721 (EPRI-CS—4404-Vol.2, pp 26.1-26.15) **Bipolar current probe for diagnosing full-scale precipitators.** Masuda, S.; Itagaki, T.; Nohso, S.; Tanaka, O.; Hironaga, K.; Fukushima, N. (Univ. of Tokyo, Japan). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A bipolar current probe for measuring negative and positive ionic current densities in a back corona field and its space potential distribution is modified so that it can be applied to full-scale precipitators for their diagnosis. The sensor at a high voltage and the control unit at grounded potential are separated by optical links. Special precautions are made so as to prevent the probe from dust contamination and protect the sensor from sparking damage. Tests are made at a laboratory precipitator and the modified probe is going to be used in a large pilot plant under practical operating

conditions. The detailed construction of the modified probe is presented, together with test results. 2 references, 15 figures.

29722 (EPRI-CS—4404-Vol.2, pp 27.1-27.18) **Method for predicting the effective volume resistivity of a sodium depleted fly ash layer.** Bickelhaupt, R.E.; Altman, R.F. (Bickelhaupt Associates, Inc., Carbondale, IL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Research has been conducted to develop a technique for predicting the effective volume resistivity of a fly ash layer that has been exposed to circumstances leading to a hot-side precipitator problem known as sodium depletion. Eight fly ashes, representing a major portion of US coals, were evaluated by subjecting 0.5 cm ash layers to a continuously applied voltage gradient of 4 kV/cm for periods of time up to 35 days at a temperature of 350°C (662°F). Resistivity was determined at 350°C before the test started and after the long period of applied voltage used to create the sodium depleted situation. In this condition, resistivity was also determined at 280°C (536°F) for an average electric field intensity of 4 kV/cm and immediately prior to breakdown. This experimental method can be used with any ash sample to estimate resistivity in a sodium depleted condition. But in addition, a correlation resulting from these resistivity data has been developed. This correlation is combined with an existing technique for predicting resistivity to produce a method for calculating the expected fly ash layer resistivity after sodium depletion has occurred. 10 references, 5 figures, 3 tables.

29723 (EPRI-CS—4404-Vol.2, pp 28.1-28.22) **Analysis of air heater - fly ash - sulfuric acid vapor interactions.** Frisch, N.W. (N.W. Frisch Associates, Inc., Kingston, NJ). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Estimation of ash resistivity level for cold-side precipitator design requires knowledge of SO_3 concentrations at the ESP entrance. Unfortunately, a number of these measurements have indicated a highly variable SO_3/SO_2 ratio. Sources and mechanisms involved in this variable factor are discussed. In particular, this analysis focuses on the air heater as a contributor to SO_3 concentration changes. An analysis of possible interactions between H_2SO_4 vapor, fly ash and regenerative air heater surfaces was made using a numerical finite-difference method. Situations considered included a fly ash-fee system and coal-firing cases involving either a clean or dirty air heater. Equations representative of condensation and adsorption mechanisms were integrated into the finite difference equations to account for the removal of acid from the flue gas. This unique Heater Interaction Model (HIM) approach provides an excellent problem solving tool for such complex issues as: optimization of gas mixing downstream of air heaters for the elimination of high resistivity ash zones; investigation of likely causes of malperformance of precipitators; and cost-effective injection of conditioning agents into various chambers of an ESP system. The basic approach is also of interest for non-SO_3 containing agents which condense from the vapor state to a particulate form. Air heater fouling problems which may occur in NH_3-based NO/sub x/ control processes can be simulated by these models. 56 references, 17 figures.

29724 (EPRI-CS—4404-Vol.2, pp 29.1-29.15) **Experimental studies of space charge effects in an ESP.** Pontius, D.H.; Bush, P.V. (Southern Research Institute, Birmingham, AL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

As particles become charged in an electrostatic precipitator they interfere with the normal corona discharge by establishing relatively immobile, local electric field effects. These effects, often referred to as space charge, were demonstrated in a wire-pipe ESP by injecting resuspended fly ash into the system. A simple mathematical model was derived for this ESP configuration to verify the behavior of the system in the presence of substantial space charge effects. 5 references, 10 figures.

29725 (EPRI-CS—4404-Vol.2, pp 30.1-30.16) **Electrostatic precipitator facility for turbulence research.** Davidson, J.H.; Shaughnessy, E.J. (Univ. of Delaware, Newark). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Turbulence is generally accepted to be detrimental to precipitator particle collection efficiency, yet the magnitude and character of electrically induced secondary flow and turbulence in full scale precipitators is not thoroughly understood. Prior laboratory scale experimental studies indicate that negative corona discharge generates turbulence but are restricted to precipitator flow aspect ratios (height to width) much less than those of interest in industrial design. This paper describes a large scale laboratory precipitator aerodynamic research facility. The electrical characteristics of negative corona operation are presented along with hot-film anemometer measurements of the electrically induced turbulence. Measurements include streamwise mean velocities, turbulence intensities, and one-dimensional energy spectra for gas speeds from 0.5 to 2.0 m/sec and electric current densities as high as 0.84 mA/m^2 of plate area. It was found that turbulence was generated throughout the precipitator. The level of turbulence production increases with increasing current but is not sensitive to increases in current density above approximately 0.3 mA/m^2. At a primary gas speed of 1.0 m/sec, a current density of 0.3 mA/m^2 causes a threefold increase in turbulence intensity over that of the background aerodynamic turbulence (from 5 to 15%). The implications of these results are discussed in terms of particle transport and precipitator collection efficiency. 13 references, 12 figures.

29726 (EPRI-CS—4404-Vol.2, pp 31.1-31.11) **Static field strength in wire-plate electrostatic precipitators with profiled collecting electrodes by an experimental method.** Akerlund, C.E. (Flakt AB, Vaxjo, Sweden). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

To introduce the highest possible energy input in an electrostatic precipitator, the field distribution at the collecting plate must be as even as possible. It must be realized, however, that there are peaks in the field distribution at such exposed points as stiffening elements. Sparkover is most probable to occur from these points. In this report the static field at profiled collecting electrodes has been analyzed using a combined conductive paper - computer aided design technique. The presented results verify that the field strength rises significantly in local areas. Therefore, investigations of the field distribution at collecting electrodes of new design are of great importance, if sparking at too low a voltage is to be avoided. 6 references, 8 figures, 4 tables.

29727 (EPRI-CS—4404-Vol.2, pp 32.1-32.10) **Fluid dynamics of electrostatic precipitators: effects of electrode geometry.** Shaughnessy, E.J.; Davidson, J.H.; Hay, J.C. (Duke Univ., Durham, NC). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI88920157. (CONF-840859—Vol.2).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The role of the electric body force in the generation of secondary flows and turbulence in precipitators is poorly understood at present, despite the fact that these disturbances are thought to be detrimental to precipitator performance. This paper undertakes a fundamental analysis of the problem using the Navier-Stokes and reduced Maxwell equations. It is shown that the rotational component of the current density causes vorticity production in the gas and is therefore the source of secondary flows and turbulence. When the current density is irrotational, as in a cylindrical precipitator, the electric body force causes a change in the pressure distribution but has no effect on the velocity field. Since the current density distribution is determined by the electrode geometry alone, the electrodes should be designed to minimize the rotational com-

ponent of the current density and thus reduce gas flow disturbances. 26 references.

29728 (EPRI-CS—4404-Vol.4, pp 1.1-1.12) **Technical manual on hood capture systems to control process fugitive particulate emissions.** Kashdan, E.R.; Spivey, J.J.; Coy, D.W.; Goodfellow, H.; Cesta, T.; Harmon, D.L. (Research Triangle Institute, NC). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper describes highlights from an ongoing effort to prepare a technical manual for hood systems to control process fugitive particulate emissions. General design considerations are presented as well as specific considerations for buoyant plumes. Two hood systems used for control of emissions from electric arc furnaces illustrate design methods and provide case studies. 6 references, 6 figures, 1 table.

29729 (EPRI-CS—4404-Vol.4, pp 11.1-11.28) **Fabric filter operation downstream of a spray dryer: pilot and full-scale results.** Rhudy, R.G.; Blythe, G.M. (Electric Power Research Institute, Palo Alto, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The Electric Power Research Institute (EPRI) is conducting an independent evaluation of spray drying FGD technology to confirm the process capabilities and to provide the electric utility industry with reliable design and operating information for spray dryer systems. This paper summarizes the results to date for the operation of a fabric filter downstream of the spray dryer. Few bag related problems have been experienced and the pressure drops have been lower than expected. Some corrosion on the fabric filter walls has occurred. SO_2 removal across the fabric filter is strongly influenced by recycle. Cooling tower blowdown water can be a positive, negative, or neutral influence depending on its composition and whether it is used for slaking or dilution. The addition of $CaCl_2$ to the atomizer feed slurry can improve fabric filter SO_2 removal. 6 references, 7 figures, 5 tables.

29730 (EPRI-CS—4404-Vol.4, pp 12.1-12.12) **Novel design concepts for an 860 MW fabric filter used with a dry flue gas desulfurization system.** Skinner, M.F.; Wolf, S.H.; Gustke, J.M.; Swenson, D.O. (Northern States Power Co., Minneapolis, MN). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Initial concerns with the application of fabric filters downstream of flue gas desulfurization systems using spray dryer absorbers centered on the potential blinding of the fabric filter bags by reaction of the moisture in the flue gas with the alkaline particulate on the bags. Three years of operation of the 100 MW spray dryer absorber and fabric filter installed at Northern States Power Company's Riverside Generating Station have demonstrated that bag blinding is not a significant problem. However, corrosion of the fabric filter casing can be severe unless precautions are taken. This paper discusses novel corrosion protection design features for fabric filters located downstream of spray dryer absorbers. These design concepts were jointly developed by Northern States Power Company (NSP); Black & Veatch, Engineers-Architects; and Joy Manufacturing Company. The design concepts applied to the fabric filters that are being installed at NSP's 860 MW Sherburne County Generating Plant, Unit 3 are as follows: flue gas reheated between the spray absorbers and fabric filters; fabric filter compartment wall temperature monitoring system installed; and fabric filter casing insulation thickness increased and insulation integrity improved. 6 references, 6 figures, 1 table.

29731 (EPRI-CS—4404-Vol.4, pp 14.1-14.12) **Spray dryer/baghouse experiences on a 1000 ACFM pilot plant.** Davis, W.T.; Reed, G.D.; Lillestolen, T. (Univ. of Tennessee, Knoxville). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper summarizes the results of a research effort conducted during 1982-1984 in which a 1000 ACFM spray dryer/fabric filter pilot plant was utilized to obtain performance data on SO_2 removal using a $Ca(OH)_2$ slurry. Data are included on the performance of the spray dryer and the spray dryer/baghouse as a combined system which clearly shows the benefits of the baghouse as a means of enhancing the overall removal. Physical/Chemical analyses of the products are also included. A discussion is also included of the operational problems encountered during the testing program. The performance data shows that the spray dryer/baghouse can be operated with efficiencies in excess of 90% under specified operating conditions. 1 references, 9 figures.

29732 (EPRI-CS—4404-Vol.4, pp 15.1-15.19) **Design and operation of the baghouse at Holcomb Station, Unit No. 1.** McLaughlin, B.R.; Emerson, R.D. (United Engineers and Constructors, Inc., Englewood, CO). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Sunflower Electric's Unit No. 1 at Holcomb Station is rated at 280 MW (net) and burns low sulfur subbituminous coal from Powder River Basin of Wyoming. Flue gas desulfurization and particulate removal is accomplished by a dry lime scrubber followed by a baghouse. Because of this location, operation of the baghouse must be coordinated with operation of the steam generator and the dry scrubber. Compared to boiler operation only, flue gas conditions leaving the dry scrubber are characterized by high dust loading and low temperatures. Particulates entering the baghouse are a combination of boiler fly ash and products of desulfurization and the relatively low temperatures are due to lime based reagent slurry injected into the scrubber modules. In addition to presenting design criteria for the baghouse, details of the hopper ash collecting and transfer system are included. Ash conveying is by mechanical drag link conveyors. Operation of the unit on coal began in early June of 1983. In addition to summarizing some problems and successes of operation for almost a year, results of initial baghouse start-up as well as operation during the tune-up period of the scrubber will be presented. 5 figures, 5 tables.

29733 (EPRI-CS—4404-Vol.4, pp 17.1-17.16) **Removal of sulfur dioxide and particulate using E-SOX.** Sparks, L.E.; Ramsey, G.H.; Valentine, R.E.; Bullock, C. (Environmental Protection Agency, Research Triangle Park, NC). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Research aimed at developing a low cost retrofit system, called E-SOX, for combined particulate and SO_2 removal is described. The E-SOX concept centers on recent advances in ESP technology that makes it possible to reduce the size of ESP required for particulate control. Results of mathematical modeling and limited pilot scale experiments on the feasibility of collecting SO_2 in the freed space are discussed. The results show that the concept is technically feasible. Modest (40-65%) levels of SO_2 removal are possible with lime as the reagent. High (over 90%) levels of SO_2 removal are possible with sodium carbonate as the reagent. Order of magnitude economic analysis shows that the process is economically feasible. Plans for additional experimental and theoretical work are presented. 2 references, 11 figures.

29734 (EPRI-CS—4404-Vol.4, pp 19.1-19.15) **Acid rain control options - impact on precipitator performance.** Belba, V.H.; Horney, F.A.; Shattuck, D.M. (Stearns Catalytic Corp., Denver, CO). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

There are numerous proposals before Congress for reducing the acid rain problem. The many technologies mentioned in the proposed legislation include coal switching, coal washing, and coal blending, fluid bed combustion, limestone injection multistage burner (LIMB), flue gas desulfurization (FGD), least emission dispatch, unit retirement or doing nothing. Some of these, such as coal switching, coal blending, coal washing and LIMB can have an adverse effect on the performance of an existing electrostatic precipitator (ESP). Such performance reductions can result in load limitations and/or the need for retrofitting flue gas conditioning or replacing the particulate control systems. This paper discusses the various sulfur dioxide reduction options and their effects on an ESP. The effects of ash from Powder River Basin, Montana, Illinois, and Appalachian high and low sulfur coals are compared to demonstrate the impact of coal switching on ESP performance. 5 references, 1 figure, 6 tables.

29735 (EPRI-CS—4404-Vol.4, pp 20.1-20.14) **Comparison of US and Japanese practices in the specification and operation and maintenance of electrostatic precipitators.** Szabo, M.F.; Altin, C.A.; Kuykendal, W.B. (PEI Associates, Inc., Cincinnati, OH). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper compares the practices of major Japanese and US companies in the utility and steel industries with regard to their procedures for specifying, operating, and maintaining electrostatic precipitators. It also provides information on the predominant designs used in each country and the frequency of various operating problems. Different approaches to solving typical operating problems are discussed. The descriptions of Japanese practices are based on interviews conducted during the authors' recent visit to Japan. Some ESP operation and maintenance problems are common to Japan and the US, including wire breakage, reentrainment, hopper pluggage, and discharge system problems. The lack of back-corona problems reported in Japan could have been masked by the additional particulate collection that occurs in the flue gas desulfurization (FGD) system. Backup FGD particulate collection is designed into all utility plants in Japan. 4 tables.

29736 (EPRI-CS—4404-Vol.4, pp 21.1-21.21) **Operation and maintenance manuals for electrostatic precipitators and fabric filters.** Szabo, M.F.; Hawks, R.D.; Hall, F.D.; Saunders, G.L. (PEDCo Environmental, Inc., Cincinnati, OH). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper describes the purpose, audience, and content of operation and maintenance (O&M) guideline manuals for electrostatic precipitators and fabric filters that are presently being prepared for EPA. The audiences being targeted are plant engineers, O&M personnel, and state and local enforcement officials. The choice of these audiences and the topics being covered in the manuals were reviewed by a panel of more than 30 government and industry representatives involved in some phase of control device O&M. After describing how these manuals will be used, the paper focuses on the O&M problems associated with: (1) use of fabric filters on coal-fired utility boilers, and (2) use of electrostatic precipitators on kraft pulp mill recovery boilers. Both of these applications will be included in the manuals as appendices. 13 references, 1 figure, 3 tables.

29737 (EPRI-CS—4404-Vol.4, pp 22.1-22.15) **Update of the performance of the Cromby Station fabric filter.** Gervasi, M.; Darrow, J.R.; Manogue, J.E. (Philadelphia Electric Co., Phoenixville, PA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

In late 1980, the Philadelphia Electric Company installed a fabric filter at Cromby Station - Unit 1, located in Phoenixville, PA. The fabric filter (a sidestream unit), in conjunction with the refurbished mechanical separators and electrostatic precipitator, brought the unit into compliance with the 1979 consent decree particulate emission rate of 0.65 pounds per 10^6 Btu heat input. From the initial start-up, the baghouse did not perform as expected. The pressure drop has been higher than design and the bag life has been shorter than anticipated. This paper describes the modifications to the collector and compares the performance of standard woven fiberglass versus PTFE membrane/woven fiberglass. 5 references, 7 figures.

29738 (EPRI-CS—4404-Vol.4, pp 23.1-23.18) **Critical electrostatic precipitator purchasing concepts.** Altin, C.A.; Altman, R.F. (Ebasco Services Inc., Norcross, GA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Over the last two decades, the electric utility industry has been faced with ever more stringent environmental regulations. This regulatory pressure coupled with political and public awareness, has resulted in utilities having to substantially, and in some cases, dramatically increase capital expenditures for the control of air pollution. When considering these expenditures and the impact of noncompliance with emission regulations on plant operations, it is mandatory that the utility purchase electrostatic precipitators which can produce consistently high-performance levels while maintaining extremely high availability levels. This paper discusses those critical purchasing concepts which affect the ultimate quality and performance levels of precipitators. Specific issues are performance-oriented versus design specifications; material only versus deliver and erect contracts; performance versus wide-range fuels; precipitator size selection; bidder qualification; and performance guarantees. 1 figure

29739 (EPRI-CS—4404-Vol.4, pp 24.1-24.13) **Reducing electrostatic precipitator power consumption.** Landwehr, J.P.; Burnett, G. (Burns and McDonnell Engineering Co., Kansas City, MO). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The current trends for minimizing the operating cost of electrostatic precipitators (ESPs) include methods for reducing electrical power consumption. One method applies to new ESP designs and includes specifying a guaranteed power consumption which requires design optimization by the ESP manufacturer. A second method consists of using a centralized control system to regulate normal operating power of all transformer-rectifier (T/R) sets. This paper presents available .echniques for determining the potential for power savings in ESP design and operation. Theoretical and practical considerations for reducing T/R power with the least sacrifice of collection efficiency area examined. Both classical methods and sophisticated computer models for predicting ESP performance as a function of power input are used to evaluate the effect of reducing power input. Actual results of power reduction testing for a high-efficiency ESP on a coal-fired utility boiler are presented. Procedures for power consumption testing to satisfy guarantees and bonus/penalty clauses are also presented. 2 figures.

29740 (EPRI-CS—4404-Vol.4, pp 25.1-25.15) **Design considerations to avoid common fly ash conveying problems.** Monahu, G.; Piulle, W. (Ash Systems Engineering, Inc., Elk Grove, IL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Almost all fossil fueled steam generators have some sort of ash handling equipment and very few of these systems are considered to be totally satisfactory. One of the main reasons for this, is the lack of an independent data base by which designers and users can assure themselves in advance that a system under consideration will do the job. The equipment vendors have regarded the underlying engineering to be proprietary and have guarded it relentlessly. This paper presents five areas of consideration (and the methodology) which do not require proprietary knowledge to apply, and which should assist in specifying, designing and maintaining pipe line ash conveyors. The paper addresses the following: system capacity, conveying velocity, solids/air ratio; conveyor layout; and pipe line conveyor construction as they apply to dilute phase vacuum conveyors. They are by far the most prevalent in the US, but the principles discussed offer insight to all types of pneumatic fly ash conveyors. 3 references, 3 figures, 2 tables.

29741 (EPRI-CS—4404-Vol.4, pp 26.1-26.20) **Feasibility of using parameter monitoring as an aid in determining continuing compliance of particulate control devices.** Carvitti, J.; Szabo, M.F.; Kemner, W. (PEDCo Environmental, Inc., Cincinnati, OH). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This study includes a discussion of the relationships between parameters and emissions or performance, and the accuracy, reliability, and cost of parameter monitoring compared with other methods of measuring emissions. Also included is a discussion of the appropriate uses of parameter monitoring, the current availability of documented data, data needs for future implementation of parameter monitoring, and the interaction required between the source and the control agency to assure cooperation in the implementation of the concept. The results are presented of a preliminary assessment to (1) ascertain the feasibility of using parameter monitoring to measure continuing compliance of stationary sources, (2) identify examples of its current application, and (3) identify issues that would need to be addressed in widespread use of parameter monitoring. The following potential advantages make parameter monitoring appear to be an attractive tool for ascertaining continuing compliance: provides an inexpensive check on proper operation and maintenance; provides diagnostic assistance during malfunctions; permits the efficient use of control agency personnel; establishes a strong basis for compliance determination; and allows the source to initiate corrective action without control agency involvement. A major hindrance to widespread application of parameter monitoring appears to be the lack of a large body of data documenting the use and importance of parameter monitoring in the day-to-day operation of stationary sources. 3 references, 2 figures, 2 tables.

29742 (EPRI-CS—4404-Vol.4, pp 28.1-28.30) **Optimizing the performance of a modern electrostatic precipitator by design refinements.** Rullman, D.H.; Neulinger, F. (Lurgi Corp., River Edge, NJ). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The continued development of optimal internal components, electrical control systems, and gas flow testing technologies is essential to the fullest functional performance of the modern electrostatic precipitator for economic application toward potentially tightening process particulate emission standards. This paper addresses the design logic, development, and full scale application of increasing gas passage width from the common 200 mm to 300 mm (8 inch to 12 inch) widths to a 400 mm (or 16 inch) width. Results of the consequently needed adaptation of electrode geometry, especially for the inhibition of back ionization, will be discussed in this context. The type of gas flow-technological tests which must be performed in order to ascertain optimal precipitator configuration for best possible flow, will also be described. Further, the advantaged use of microcomputers versus analog type controls for high voltage control, is presented. A superordinated, central process computer assumes the functions of control, supervision, and optimization of an inplace precipitator, thereby minimizing clean gas dust content and overall electrical energy consumption. 3 references, 24 figures, 1 table.

29743 (EPRI-CS—4404-Vol.4, pp 29.1-29.16) **Weighted discharge electrodes - a solution to mechanical fatigue problems.** Knapik, J.A. (Neundorfer, Inc., Willoughby, OH). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This paper discusses a specific aspect of discharge electrode failure, i.e. mechanical fatigue at the shroud-wire interface. This type of failure has been specifically addressed in a novel approach of changing the rigidity of the shroud in order to reduce the stress concentrations in the area of the interface. It is demonstrated that using a close wound spring as the shroud material, as opposed to the solid shroud that is in common use, significantly reduces stress concentrations at the interface. This stress reduction would be expected to enhance fatigue life. Further, the design of the shroud provides for the electrode to be hot headed into the electrode end (button, hook, etc.), eliminating the need for crimping the shroud. This elimination of the crimp removes a source of sharp corners on the shroud, an area of high electrical stress. 3 references, 12 figures.

29744 (EPRI-CS—4404-Vol.4, pp 30.1-30.11) **Measurement of the electrokinetic transport properties of particles in an electrostatic precipitator.** Clark, W.T. III; Bond, R.L.; Mazumder, M.K. (Univ. of Arkansas, Little Rock). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A study of submicrometer particle behavior within a laboratory model, single stage, wire-and-plate type electrostatic precipitator (ESP) has been performed. A two-color, four-beam, two-dimensional laser Doppler velocimeter (LDV) was constructed to observe the two-dimensional kinetics of submicrometer diameter particles in the ESP. Particle migration velocity toward the collection wall was found to be dependent on particle position in relation to the wires and wall and on the voltage applied to the wires. This dependency indicates that particle electrokinetics is dependent upon the electric field magnitude. Values for migration velocity and downstream velocity were experimentally determined with the LDV system. These values were used to calculate the Deutsch-Anderson efficiencies which were in agreement with Climet particle analyzer efficiencies in the free stream of the ESP. 3 references, 6 figures.

29745 (EPRI-CS—4404-Vol.4, pp 31.1-31.10) **Electrostatic precipitator EUS section failure: operation and maintenance.** Theodore, L.; Reynolds, J.; Taylor, F.; Filippi, A.; Errico, S. (Manhattan College, Riverdale, NY). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

This work is an extension of a study which presented a method to calculate the probability of a unit being out of compliance (i.e., falling below a designated minimum overall collection efficiency) due to the occurrence of a given number of randomly located bus section failures. This study extends the calculations to include the element of time and is intended to assist those involved with ESP operation and maintenance, particularly in scheduling outages and/or derating of units. The calculations are based on a statistical extrapolation from previous bus section failure rate data and provide an intelligent prediction as to when the unit can be expected to be out of compliance due to bus section failure. This cal-

culational tool can be applied in one of two different modes depending on the type of prior information available. If an estimated number of bus section failures for the last several maintenance periods (i.e., periods between scheduled outages) is known, the first mode can be applied. If, however, the dates and locations of the bus section failures during the present period are available, the second mode should be used. Both modes provide the same type of information to the user: the probability that this unit will be out of compliance by the next scheduled outage (or, for that matter, by the end of any designated period of time). This information can be used to assist the user in determining the optimum time interval to employ in the scheduling of maintenance outages. 9 references, 2 tables.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 29746

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 30103

29746 **(EDF-DER-RA—1984) D.E.R. 84 panorama E.D.F. progress report.** (Electricite de France, 75 - Paris). 1985. 337p. (In French). NTIS (US Sales Only), PC A15/MF A01. File Number DE86751323.

This progress report presents the panorama of the studies carried out by the "Direction des Etudes et des Recherches" (E.D.F): nuclear boilers; classical and nuclear thermal power plants, hydraulic power plants; electrical equipment; network analysis; environmental impacts; uses of electric power; new aspects of energy; applied informatics and mathematics; normalization and patents. A selection of the publications of the year is finally presented.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 29812, 29825, 29826, 29827, 29828, 29830, 29834, 29855, 29856, 29857, 29859, 29861, 29862, 29867, 29868

29747 **(AIF/NESP—034) Intact decommissioning of nuclear power plants: a dose assessment.** Ostrow, S.L.; Oztunali, O.O.; Grant, T.J.; Healey, J.H.; McCaul, C.; Romero, I. (Ebasco Services, Inc., New York (USA)). Mar 1986. 226p. Atomic Industrial Forum, Inc., 7101 Wisconsin Ave., Bethesda, MD 20814-4891. File Number TI86901286.

Several alternative methods for decommissioning nuclear power plants have been studied, including mothballing, entombment, and dismantlement/removal. Compliance with current NRC regulations and interpretations greatly favors immediate dismantlement, primarily due to the ongoing economic costs associated with maintenance and surveillance in the other methods. This report defines and examines the feasibility and radiological characteristics of a fourth option: intact decommissioning. Under this procedure, after the fuel and radioactive liquids and wastes are removed, the bulk of the most highly radioactive items in the plant (e.g., the reactor vessel and internals, and the primary system) would be left in place within an established, sealed intact decommissioning boundary, such as the Reactor Building. Radioactive items outside the boundary would be removed. The boundary would provide long-term protection against the environment. It is assumed there would be no maintenance or surveillance. The effect on the public of eventual release of residual radioactivity through all reasonable pathways is evaluated and compared to that determined for the other decommissioning options. 34 figs., 47 tabs.

29748 **(CONF-860204—41) Effects of time and other variables on fission product release rates.** Lorenz, R.A.; Osborne, M.F.; Collins, J.L. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 3p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009457.

From Thermal reactor safety meeting; San Diego, CA, USA (2 Feb 1986).

The releases of krypton and cesium from highly irradiated LWR fuel have been examined in detail. The main interest has been the effect of time on the rate of release and the effects of heatup and cooldown cycles. The minute-by-minute release rates for fission product ^{85}Kr from commercial fuel irradiated in the H.B. Robinson PWR are shown. The release rate, fraction per minute, is calculated in the same manner as release rates given in NUREG-0772; the fission gas, cesium, and iodine release rate curve from that report is also shown.

29749 **(DOE/ET/34072—4-Draft) Department of Energy extended burnup data base. Final report.** Woodis, A. (Science Applications International Corp., Los Altos, CA (USA)). 31 Dec 1985. Contract AC02-80ET34072. 87p. NTIS (US Sales Only), PC A05/MF A01; 1; GPO Dep. File Number DE86010106.

The US Department of Energy has sponsored projects to develop and demonstrate the technology to extend burnup of light water reactor fuels. Data from these projects are stored in the National Fuel Performance Data Base along with project data sponsored by the Electric Power Research Institute. This report contains a summary of the US Department of Energy extended burnup data that are contained in the National Fuel Performance Data Base. 50 tabs.

29750 **(HEDL—7467) Light Water Reactor Pressure Vessel Surveillance Dosimetry Improvement Program. PSF Blind Test workshop minutes. Summary.** Guthrie, G.L.; Lippincott, E.P.; McGarry, E.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 1984. Contract AC06-76FF02170. 205p. (CONF-8404301—Summ.). NTIS, PC A10/MF A01 - GPO. File Number TI86009423.

From PSF blind test workshop; Richland, WA, USA (9 Apr 1984).

A "Blind Test" workshop was held on April 9-11, 1984, at the Holiday Inn in Richland, WA. At the workshop, participant groups compared "Blind" calculations with existing data which was unavailable to them at the time the calculations were made. The purpose of the exercise was to allow each participant group to test the group's ability to predict "in-wall" mechanical property degradation for a simulated nuclear reactor pressure vessel irradiation.

29751 **(NUREG/CP—0067-Vol.1) Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1.** Cullen, W.H. (ed.). (Materials Engineering Associates, Inc., Lanham, MD (USA)). Apr 1986. 485p. (MEA—2090-Vol.1; CONF-8505273—Vol.1). NTIS, PC A21/MF A01 - GPO. File Number TI86901353.

From 2. International Atomic Energy Agency specialists' meeting on subcritical crack growth; Sendai, Japan (15 May 1985).

This report is a compilation of the papers which were presented at the Second IAEA Specialists' Meeting on Subcritical Crack Growth, held at the Ministry of Trade and Commerce, in Sendai, Japan, on May 15-17, 1985. This meeting took place four years after the first meeting, held on May 13-15, 1981, in Freiburg, Germany. All contributions address the issue of subcritical crack growth rates and processes in steels and alloys for nuclear reactor pressure vessels, piping and reactor internals. This symposium was divided into four sessions, dealing with: (a) test methods and interlaboratory comparison test programs, (b) recent results from test programs, (c) mechanisms for environmentally-assisted cracking, and (d) utilization of data and models. Several critical variables have been identified, the conditions, constraints and effects of various mechanisms have been defined, and the guidelines for processing and applying fatigue crack growth data have been developed.

29752 **(NUREG/CP—0067-Vol.2) Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2.** Cullen, W.H. (ed.). (Materials Engineering Associates, Inc., Lanham, MD (USA)). Apr 1986. 508p. (MEA—2090-Vol.2; CONF-8505273—Vol.2). NTIS, PC A22/MF A01 - GPO. File Number TI86901354.

From 2. International Atomic Energy Agency specialists' meeting on subcritical crack growth; Sendai, Japan (15 May 1985).

This report is a compilation of papers which were presented at the Second IAEA Specialists' Meeting on Subcritical Crack Growth, held at the Ministry of Trade and Commerce, Sendai, Japan, on May 15-17, 1985. This volume contains the presentations of Sessions III and IV, addressing the issues of mechanisms for environmentally-assisted cracking, and utilization of data and models, respectively.

29753 **(NUREG/CR—4330-Vol.1) Review of light water reactor regulatory requirements. Identification of regulatory requirements that may have marginal importance to risk. Volume 1.** Mullen, M.F.; Scott, W.B.; Andrews, W.B.; Bickford, W.E.; Boegel, A.J.; Little, W.W.; Pelto, P.J.; Powers, T.B. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 82p. (PNL—5809-Vol.1). NTIS, PC A05/MF A01 - GPO. File Number TI86009678.

The US Nuclear Regulatory Commission has initiated a program to identify regulatory requirements associated with 10 CFR 50 that, if deleted or appropriately modified, would improve the efficiency and effectiveness of the NRC regulatory program without adversely affecting safety (October 3, 1984, "Federal Register," 49 FR 39066). This report describes the results of a study conducted by Pacific Northwest Laboratory (PNL) to assist the NRC in executing the program. The report identifies 45 regulatory requirements (and associated regulatory guidance) that could potentially be relaxed or eliminated to reduce regulatory burdens without compromising public health and safety. If subsequent, more detailed studies and evaluations confirm these initial findings, NRC staff will recommend and implement appropriate regulatory changes, which may include modification or elimination of some requirements.

29754 **Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments.** Park, J.Y.; Ruther, W.E.; Kassner, T.F.; Shack, W.J. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, IL 60439). *Journal of Engineering Materials and Technology;* **108**: No. 1, vp(Jan 1986).

Stress corrosion cracking of type 304 stainless steel has been studied with fracture-mechanics-type standard 25.4-mm-thick compact tension specimens in simulated boiling-water reactor environments at 289°C and 8.3 mpa. Tests were performed with either constant or cyclic loading. The latter tests used a positive sawtooth waveform with an unloading time of 1 or 5 S, a load ratio R (minimum load to maximum load) of 0.2 to 0.95, and a frequency F of 8 x 10^{-4} to 1 x 1^{-1} hz. Crack lengths and crack growth rates were determined by the compliance method; crack mouth opening displacement was measured with in-situ clip gauges. Fractography was used to examine the mode of cracking and to confirm the compliance method for crack length determination. The test environments were high-purity deionized water with 0.2- to 8-ppm dissolved oxygen, and water with 0.2-ppm dissolved oxygen and 0.1-ppm sulfate (as H_2SO_4). Two heats with a carbon content of 0.06 wt percent were investigated in solution-heat-treated and furnace-sensitized conditions. Degree of sensitization varied from approx. = 0 to 20 $c.cm^2$ as measured by the electrochemical potentiokinetic polarization method. The first heat was tested in water with 0.2- and 8-ppm dissolved oxygen and with 0.2-ppm dissolved oxygen and 0.1-ppm sulfate. The loading conditions encompassed the range F=8 x 10^{-2} to 8 x 10^{-4} hz, K/sub max/=28 to 72 mpa. M/sup 1/2/, and R=0.95.

29755 **Fuel assembly for the production of tritium in light water reactors.** Cawley, W. E.; Trapp, T. J. (to The United States of America as represented by the Department of Energy). US Patent 4,526,741. 2 Jul 1985. Filed date 10 Jul 1983. vp.

PAT-APPL-503129.

A nuclear fuel assembly is described for producing tritium in a light water moderated reactor. The assembly consists of two intermeshing arrays of subassemblies. The first subassemblies comprise concentric annular elements of an outer containment tube, an annular target element, an annular fuel element, and an inner neutron spectrums shifting rod. The second subassemblies comprise an outer containment tube and an inner rod of either fuel, target, or neutron spectrum shifting neutral.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 29297, 29351, 29362, 29370, 29387, 29747, 29748, 29749, 29750, 29751, 29752, 29753, 29755, 29812, 29830, 29831, 29832, 29834, 29836, 29837, 29838, 29839, 29840, 29841, 29842, 29843, 29844, 29845, 29847, 29854, 29855, 29856, 29857, 29858, 29859, 29861, 29862, 29868, 29869, 29873, 30075

29756 **(CEA-CONF—8032) In-core measurements with platinum self powered detectors in a French PWR.** Duchene, J.; Sengler, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Apr 1985. 22p. (CONF-8504205—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751342.

From IAEA/NPPCI specialists meeting on new instrumentation of water cooled reactors; Dresden, F.R. Germany (23 Apr 1985).

An experience of Self Powered Flux Detectors application in a French PWR is reported. These detectors with platinum emitter are tested in order to evaluate their capability for in core flux measurements. The first results given in this paper concern the technological behaviour specially the insulation resistance evolution, the change in sensitivity due to fuel burn up, Xenon oscillation, rod bank insertions, and their response during different power transients.

29757 **(CEA-CONF—8052) French study and research program on water cooled reactor safety.** Zammite, R. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. d'Analyse de Surete). May 1985. 17p. (In French). (CONF-8505241—1; DAS—170). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751367.

From Technical committee on reactor safety research conference; Vienna, Italy (29 May 1985).

Electricite de France and the CEA (Commissariat a l'Energie Atomique), joined to obtain, in several fields, the knowledge and qualified calculation tools, they need to develop new means to face the potential consequences of accidents. The bringing on of an important number of PWR units in France in the eighties involves a focusing on these studies. The main fields concerned are the following ones: core cooling accidents and severe accident prevention; fuel behavior in case of accident; containment behavior in accidental situation; emission, transfer and release of fission products in case of accident; probabilistic risk analysis, human factor and earthquakes.

29758 **(CEA-CONF—8130) Field tests and examinations in cell of French fuel assemblies.** Bordes, P.; Dumont, A.; Van Craeynest, J.C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1985. 13p. (In French). (CONF-850928—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751363.

From International symposium on contribution of materials investigation to the resolution of problems encountered in PWR plants; Chinon, France (3 Sep 1985).

This paper presents the field tests carried out on more than 70 assemblies and those realized at the hot laboratory on a whole assembly of 25 rods taken from pressurized water power plants operating in France: dimension examination; fission gas release; oxidation and hydridation of cans.

29759 (CONF-850314—Vol.2, pp 281-284) **Structural analysis of TMI-2 defueling canisters.** McGuinn, E.J.; Childress, P.C. (Babcock and Wilcox, Lynchburg, VA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The core debris from the damaged TMI-2 reactor will be stored and shipped in canisters designed by Babcock and Wilcox (B and W) for General Public Utilities Nuclear Corporation (GPUNC). Those canisters are of three different types - filter, knockout or fuel - and are described in greater detail in a compan-

ion paper, "Defueling Canister Designs for the TMI-2 Core Removal Program." Structurally, the canisters consist of nearly identical pressure vessels encapsulating different internal modules depending on the function of the canister. For normal operating conditions, the pressure boundary components - the shell, upper head, and lower head - were analyzed to the requirements of Section VIII Division 1 of the ASME Code. Design pressures of 150 psig (internal) and 30 psig (external) bound the actual operating environment. As described in the GPUNC design specification, a canister can be subjected to any one of a series of postulated on-site accidents. For all cases, the design criteria is that for the predicted deformed geometry, criticality control of the canister contents must be maintained. The canister in conjunction with the shipping cask must also meet the requirements of Federal Regulation 10CFR71 for transportation accidents. In the filter and knockout canisters impact velocities for the various canister drops were used to determine the impact energy and associated impact forces. These forces were used in an ANSYS analysis to determine the structural deformations and stress levels in the internals. The fuel canister internals, with its complex geometry, was judged to be too difficult to rely on analytical solutions; geometric bounds were conservatively generated using estimates of material behavior and were then confirmed by a comprehensive drop test program.

29760 (CONF-850314—Vol.2, pp 285-287) **TMI-2 defueling canister reactivity calculations.** Pettus, W.G.; Hassler, L.A.; Holman, P.L.; Jones, H.M.; Worsham, J.R. (Babcock and Wilcox Co., Lynchburg, VA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Detailed Monte Carlo reactivity calculations have been carried out for each of the three types of TMI-2 defueling canisters. All design criteria have been satisfied with due consideration to credible accident contingencies and with adherence to conservative modeling procedures.

29761 (CONF-850314—Vol.2, pp 289-291) **Defueling canister designs for the TMI-2 core removal program.** Childress, P.C.; McGuinn, E.J. (Babcock and Wilcox, Lynchburg, VA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The accident at TMI-2 resulted in most of the reactor core being reduced to debris ranging in size from very small fines to partial fuel assemblies. Babcock and Wilcox (B and W) has developed designs for three types of waste packages (canisters) which will be used with different defueling techniques to encapsulate the fuel debris for shipment to and subsequent storage at Idaho National Engineering Laboratory (INEL).

29762 (CONF-850314—Vol.2, pp 293-296) **TMI-2 defueling filter development tests.** Storton, J.M.; Kramer, J.F. (Babcock and Wilcox Co., Lynchburg, VA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

An important aspect of the Three Mile Island Unit-2 (TMI-2) Recovery Operation is the water treatment techniques used to maintain water clarity and control radiation levels during the operation. It has been determined that a water clarity $\leqq$ 1.0 Nephelometric Turbidity Unit (NTU) is required to meet these two objectives. Conventional filtration systems do not meet all of the criteria constraints unique to the defueling operation. Two novel sintered stainless steel media filter concepts were identified and investigated. The test results of the pilot plant program conducted at Babcock and Wilcox's Lynchburg Research Center leading to the development of a Filter Canister are presented.

29763 (CONF-850314—Vol.2, pp 351-355) **Radiation protection features of Beaver Valley.** Martin, R.E.; Kiernan, R.J. Jr. (Duquesne Light Co., Pittsburgh, PA; Stone and Webster Engineering Corp., Boston, MA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Beaver Valley Power Station - Unit 2 (BVPS-2) is an 833-MWe PWR under construction at Shippingport, PA. Although the unit was originally designed to share most of the radwaste systems of BVPS-1, several decisions in the mid to late 1970's led to the development of essentially independent systems for BVPS-2. The relatively recent commitment to new systems allowed application of several state-of-the-art processes as well as desirable radiation protection features. Many features have been incorporated into the BVPS-2 design to increase system reliability and serviceability and to minimize personnel exposure during both operation and maintenance. These features minimize crud development and crud traps, provide separation and shielding between radioactive components, utilize remote handling equipment, allow draining and flushing of components, and prevent the spread of airborne contaminants. Many of these features have been incorporated based on experience with operation of earlier generation nuclear plants. Others were incorporated as good engineering practice, as a means of compliance with the latest or anticipated regulatory guidance and requirements, and as an effort to meet as low as reasonably achievable (ALARA) objectives.

29764 (CONF-850314—Vol.2, pp 363-368) **Three Mile Island Unit 2 dry-canal defueling water cleanup system: an update.** Katonak, L.E.; Hitz, C.G. (Bechtel National, Inc., Oak Ridge, TN; GPU Nuclear Corp., Middletown, PA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

During the defueling phase of the Three Mile Island Unit 2 (TMI-2) cleanup effort, the reactor vessel (RV) with internals indexing fixture (IIF), the refueling canal, and the spent fuel pool will be partially filled with water to enable the fuel transfer operation to occur safely. This water must be maintained at a Cs-137 concentration of 0.01 to 0.02 μCi/ml and a clarity level of approximately 1 nephelometric turbidity unit (NTU). These criteria were selected to ensure that radiation dose rates to workers one foot above the defueling platform are maintained as low as reasonably achievable (ALARA), and to maintain sufficient water clarity to allow workers to see underwater components in the vessel, refueling canal, and spent fuel pool during the defueling operation. A defueling water cleanup system (DWCS) has been designed to meet these objectives. Two subsystems constitute the DWCS. One subsystem processes water within the vessel/internals indexing fixture (a cylindrical extension of the vessel) with a 400 gallons-per-minute (gpm) design basis flowrate for filtration and a 60 gpm flowrate for ion exchange. The other subsystem processes refueling/spent fuel pool water with a 400 gpm filtration system and a 30 gpm ion-exchange system.

29765 (EPRI-NP—4478) **1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings.** Partridge, M.J. (Dominion Engineering, Inc., McLean, VA (USA)). Mar 1986. 628p. (CONF-8411254—Summs.). Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303. File Number TI86920242.

From Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing; Palo Alto, CA, USA (12 Nov 1984).

The contractors' meeting on "Secondary Water Initiated IGC of Alloy 600" was organized in an effort to give those working in this area an opportunity to share their results, ideas and plans. Topics discussed included: (1) transport phenomena and crevice chemistry; (2) correlations and models of electrochemical and isothermal tests; (3) chemistry of carbides and surface films; (4) model boiler and heat transfer studies; and (5) summary experience and test results regarding IGA/IGSCC rates.

29766 (EUR—9877) **Demonstration of spent-fuel measurement equipment at KWO Obrigheim facility.** Schenkel, R.; Bosler, G.; Klosterbuer, S. (Commission of the European Communities, Luxembourg). 1985. 49p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86751609.

The ION-1/FORK system measurement developed at the Los Alamos National Laboratory is a first step in the development

of portable or transportable burnup monitor useful in verifying inventories. The ION-1/FORK gamma-ray and neutron detector system for measuring spent-fuel elements was demonstrated at the KWO Obrigheim reactor facility. The equipment and experimental set-up is first presented. Then, the experimental results are given and analyzed.

29767 **(FRADOC—1-1) FRAMATOME PWR technological development.** Charbonneau, S. (Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)). 1985. 11p. (CONF-840681—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751360.

From Total energy '84 exhibition and conference; Guangzhou, China (12 Jun 1984).

FRAMATOME's export model pressurized water reactor (PWR) reflects 25 years of experience in the nuclear field. To fully appreciate the positive impact of this experience on PWR design, it is first necessary to review FRAMATOME's position as a reactor vendor, the development of its PWR technology, and its current product.

29768 **(FRADOC—1-2) Project of the advanced PWR reactor N4, at Chooz.** Labat, P.; Leroy, C.; Prouillac, C. (Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)). 1985. 17p. (In French). (CONF-8510277—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751359.

From VGB congress on power plants; Hague, Netherlands (9 Oct 1985).

This paper presents the realization of the first advanced reactor of the 1400/1500MWe series. The technical characteristics of this type of boiler are first given; then the Franco-Belgian collaboration is recalled and the conditions of realization presented.

29769 **(FRADOC—1-3) FRAMATOME studies on high conversion water reactor concept.** Millot, J.P. (Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)). 1985. 10p. (CONF-8411237—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751358.

From Technical committee and workshop on advanced light and heavy water reactor technology; Vienna, Austria (26 Nov 1984).

This paper presents FRAMATOME studies concerning the optimization of water power reactors. Three fuel models have been taken into account: fuel with grid and stainless steel cladding; fuel with grid and zircaloy cladding; and, fuel with grid, zircaloy cladding and spectral shift.

29770 **(FRADOC—2-6) Structural analysis of PWR fuel assemblies in LOCA and seismic conditions.** Leroux, J. (Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)). 1985. 9p. (CONF-8411243—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751318.

From Meeting on fuel assembly structure; Juelich, F.R. Germany (15 Nov 1984).

The purpose of this paper is a general presentation of the analyses performed by Fragema to evaluate the effects of the LOCA and the SSE (Safe Shutdown Earthquake) on the PWR Fuel Assembly structure. This evaluation requires much complex analysis such as the thermohydraulic effects of blowdown, seismic loading generation and structural model development of the reactor and fuel assembly. The following main points are developed: fuel assembly safety requirements, fuel assembly behaviour under LOCA and SSE conditions, organizational flow chart, fuel assembly modelling, fuel assembly analysis and typical results.

29771 **(FRADOC—3-1) Maintenance and repair tools of the 900 MW PWR units in France.** Blary, F.; Castaing, C.; Hassig, J. (Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)). 1985. 24p. (In French). (CONF-840623—1; IAEA-SM—274-C5). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751316.

From International symposium on nuclear power plant outage experience; Karlsruhe, F.R. Germany (18 Jun 1984).

EDF and FRAMATOME have developed special tools and, repair and maintenance procedures to decrease the unavailability of the PWR units and the dosimetry of the personnel of maintenance. This report presents the solution adopted to face the problem of replacement of the internal upper structure pins of 21 units: 1) study and realisation of important industrial means; 2) development of a strategy: the pin replacement is separated from the guide tube replacement by the creation of a pin replacement shop, and, as often as it is possible, the "AQUARIUM" method allows to replace the guide-tubes with the aid of a mobile pool called AQUARIUM outside the critical way of shutdown.

29772 **(FRADOC—3-2) Steam generator replacement.** Sort, M. (Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)). 1985. 22p. (CONF-841093—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751315.

From Specialist meeting on steam generator problems; Stockholm, Sweden (1 Oct 1984).

This paper presents the content of the PWR steam generator replacement program of FRAMATOME for its French and overseas clients. The main technical option adopted by FRAMATOME are given.

29773 **(NUREG—1181) Technical specifications, Palo Verde Nuclear Generating Station, Unit No. 2 (Docket No. 50-529). Appendix A to License No. NPF-51.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Apr 1986. 512p. NTIS, PC A22/MF A01 - GPO. File Number TI86901346.

Information is presented concerning the technical specifications for the Palo Verde-2 Reactor. Areas of interest discussed in this report include: safety limits and limiting safety system settings; limiting conditions for operation and surveillance requirements; design features; and administrative controls. 19 figs., 62 tabs.

29774 **(NUREG/CR—4022) Pressurized thermal shock evaluation of the Calvert Cliffs Unit 1 Nuclear Power Plant.** Abbott, L. (ed.). (Oak Ridge National Lab., TN (USA)). Sep 1985. Contract AC05-84OR21400. 668p. (ORNL/TM—9408). NTIS, PC A99/MF A01 - GPO. File Number TI86004581.

An evaluation of the risk to the Calvert Cliffs Unit 1 nuclear power plant due to pressurized thermal shock (PTS) has been completed by Oak Ridge National Laboratory (ORNL) with the assistance of several other organizations. This evaluation was part of a Nuclear Regulatory Commission program designed to study the PTS risk to three nuclear plants, the other two plants being Oconee Unit 1 and H.B. Robinson Unit 2. The specific objectives of the program were to (1) provide a best estimate of the frequency of a through-the-wall crack in the pressure vessel at each of the three plants, together with the uncertainty in the estimated frequency and its sensitivity to the variables used in the evaluation; (2) determine the dominant overcooling sequences contributing to the estimated frequency and the associated failures in the plant systems or in operator actions; and (3) evaluate the effectiveness of potential corrective measures.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 29835, 30162

29775 **(JUEL—1569) Closed thorium cycles in the pebble bed HTR.** Teuchert, E.; Ruetten, H.J.; Werner, H.; Haas, K.A.; Schulten, R. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Jan 1979. 47p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86901195.

For the pebble bed high temperature reactor an uranium/thorium closed fuel cycle Th/U is introduced which achieves the conversion ratio of 0.82 averaged over 30 years lifetime, and the

fissile inventory of only 1270 kg/GW/sub e/. It allows minimum uranium ore requirement for some 2 generations. Secondly, a Th/U-prebreeder is introduced which produces U-233 for the installation of HTR-netbreeder fuel cycle inventories. The U-233 production per required U_3O_8 is by a factor of 2.3 higher than the Pu production of a LWR for plutonium cycles. Thirdly, an alternative of the closed thorium cycle is introduced which meets the demands of non-proliferation. No weapons grade uranium appears anywhere in the cycle. The plutonium content of the reprocessed elements is strongly denatured by the even isotopes Pu-240 and Pu-242 and its quantity is extremely low. All three cycles are economic. The technological feasibility of the fuel elements is largely ensured by the THTR element test experience. The detailed features of the cycles are outlined as far as relevant for their assessment. 14 refs., 11 figs., 16 tabs.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

REFER ALSO TO CITATION(S) 30070

29776 **(AECL—7809) Two-phase natural circulation experiments in a pressurized water loop with CANDU geometry.** Ardron, K.H.; Krishnan, V.S.; McGee, G.R.; Anderson, J.W.D.; Hawley, E.H. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jul 1984. 30p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900380.

Work performed under Canada/US Waste Management Information Exchange Agreement.

A series of tests has been performed in the RD-12 loop, a 10-MPa pressurized-water loop containing two active boilers, two pumps, and two, or four, heated horizontal channels arranged in a symmetrical figure-of-eight configuration characteristic of the CANDU reactor primary heat-transport system. In the tests, single-phase natural circulation was established in the loop and void was introduced by controlled draining, with the surge tank (pressurizer) valved out of the system. Results indicate that a stable, two-phase, natural circulation flow can usually be established. However, as the void fraction in the loop is increased, large-amplitude flow oscillations can occur. The initial flow oscillations in the two halves of the loop are usually very nearly 180° out-of-phase. However, as the loop inventory is further decreased, an in-phase oscillation component is observed. In tests with two parallel, heated channels in each half-loop, oscillations associated with mass transfer between the channel pairs are also observed. Although flow oscillations can lead to intermittent dryout of the upper elements of the heater-rod assemblies in the horizontal channels, natural circulation cooling appears to be effective until about 50% of the loop inventory is drained; sustained flow stratification then occurs in the heated channels, leading to heater temperature excursions. The paper reviews the experimental results obtained and describes the evolution of natural circulation flow in particular cases as voidage is progressively increased. The stability behavior is discussed briefly with reference to a simple stability model.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 29805, 30082, 30376, 31278

29777 **(CONF-860605—7) Measurements of $^{10}B(n,He)$ reaction rates in a mockup control rod in ZPPR.** Brumbach, S.B.; Collins, P.J.; Oliver, B.M. (Argonne National Lab., Idaho Falls, ID (USA); Rockwell International Corp., Canoga Park, CA (USA)). 1986. Contract W-31-109-ENG-38. 25p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007518.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

This paper reports the first direct measurement of ^{10}B capture rate in a mockup control rod in a critical assembly. The experiment used the helium accumulation fluence monitor (HAFM) technique. 13 refs.

29778 **(CONF-860610—9) Local transport of vertically- and horizontally-emitted sodium oxide aerosols.** Fields, D.E.; Miller, C.W.; Cooper, A.C. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86006091.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

Liquid-metal cooled breeder reactors are expected to use large quantities of sodium or sodium-potassium alloy, and evaluation of the possible consequences of a liquid-metal fire, henceforth referred to as a sodium fire, is an important consideration. Of particular interest is the sodium aerosol concentration at the air intake ports that are used for reactor cooling, and which might suffer restricted flow under high aerosol concentrations. We have devised and applied a methodology for estimating the concentration of aerosols released vertically and horizontally from building surfaces and monitored at other building surface points. We have used this methodology to make calculations that indicate the time-development of aerosol build-up, and the maximum aerosol concentrations, at air intake ports. Building wake effects, momentum-driven plume rise, and density-driven plume rise are considered.

29779 **(CONF-860610—10) Model for LMFBR core transient analysis in real-time.** Tzanos, C.P. (Argonne National Lab., IL (USA)). 1986. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86006173.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

This paper discusses the modeling of LMFBR core transients. It is shown that with a proper choice of shape functions a nodal approximation of the coolant, cladding, and fuel temperature distributions leads to adequately accurate power and temperature predictions, as well as adequately short computation times.

29780 **(EDF—84H531172) Ten years of sodium cooled steam generator tests on the C.G.V.S. Synthesis of the results obtained on these equipments and operation experiments of an industrial size test facility.** Fontaine, J.P.; Llory, M.; Quinet, J.L. (Electricite de France, 78 - Chatou). Apr 1984. 117p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751339.

From 1970 to 1980, Electricite de France carried out tests on four steam generators of the fast neutron reactor series on an industrial size testing equipment, the C.G.V.S. (large power testing Circuit for Steam Generators heated by Sodium). After a presentation of the testing installation, types of tests carried out and tested apparatus, a balance of lessons drawn from the circuit exploitation, and from the main results obtained on the tested equipments and on the means of calculation COPI and SICLE codes developed or adopted to simulate steam generator operation. 33 figs., 50 refs.

29781 **(WAPD-TM—1278) Fabrication and loading of fuel rods for the Light Water Breeder Reactor (LWBR Development Program).** DeGeorge, V.V.; Goldberg, I. (eds.). (Bettis Atomic Power Lab., West Mifflin, PA (USA)). Mar 1986. Contract AC11-76PN00014. 220p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE86009977.

The fabrication and inspection operations used for the manufacture of approximately 24,000 fuel rods for the Light Water Breeder Reactor are described in detail. This report also describes the development work to establish the fabrication procedures and investigations undertaken to solve problems encountered during manufacturing. The approximately 10 foot long LWBR fuel rods were made in four outside diameters ranging from 0.306 inch (seed) to 0.832 inch (reflector). Each rod was fabricated by sealing cylindrical oxide fuel pellets (ThO_2-$U^{233}O_2$), into Zircaloy seamless tubes by welding Zircaloy enclosures at the ends. The special inspections performed to assure a high quality product meeting all design requirements are described. These inspections included weld radiography and ultrasonic inspection, in-motion radiography to evaluate internal dimensions and pellet integrity, helium leak testing, corrosion testing, and detection of surface contamination. The facilities designed and built for this fabrication effort are described

and the resultant manufacturing yields are presented. 13 refs., 42 figs., 20 tabs.

29782 **Mechanically attached load pad for liquid metal nuclear reactor fuel assemblies.** Grover, J. M.; Williams, L. S. (to The United States of America as represented by the United States Department of Energy). US Patent 4,543,233. 24 Sep 1985. Filed date 8 Apr 1982. vp.

PAT-APPL-366458.

A mechanically attached load pad for the duct of a liquid metal nuclear reactor fuel assembly.

2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

29783 **(BNL—37407) High power density reactors based on direct cooled particle beds.** Powell, J.R.; Horn, F.L. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 26p. (CONF-850103—14). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86005679.

From 2. symposium on space nuclear power systems; Albuquerque, NM, USA (14 Jan 1985).

Reactors based on direct cooled HTGR type particle fuel are described. The small diameter particle fuel is packed between concentric porous cylinders to make annular fuel elements, with the inlet coolant gas flowing inwards. Hot exit gas flows out long the central channel of each element. Because of the very large heat transfer area in the packed beds, power densities in particle bed reactors (PBR's) are extremely high resulting in compact, lightweight systems. Coolant exit temperatures are high, because of the ceramic fuel temperature capabilities, and the reactors can be ramped to full power and temperature very rapidly. PBR systems can generate very high burst power levels using open cycle hydrogen coolant, or high continuous powers using closed cycle helium coolant. PBR technology is described and development requirements assessed. 12 figs.

29784 **(BNL—37931) High flux research reactors based on particulate fuel.** Powell, J.R.; Takahashi, H.; Horn, F.L. (Brookhaven National Lab., Upton, NY (USA)). Feb 1986. Contract AC02-76CH00016. 36p. (CONF-860171—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009919.

From Advanced steady state neutron sources; Washington, DC, USA (1 Jan 1986).

High Flux Particle Bed Reactor (HFPBR) designs based on High Temperature Gas Reactors (HTGR) particular fuel are described. The coated fuel particles, ~500 microns in diameter, are packed between porous metal frits, and directly cooled by flowing D_2O. The large heat transfer surface area in the packed bed, ~100 cm^2/cm^3 of volume, allows high power densities, typically 10 MW/liter. Peak thermal fluxes in the HFPBR are 1 to 2 x 1^{16} n/c^2 sec., depending on configuration and moderator choice with beryllium and D_2O Moderators yielding the best flux performance. Spent fuel particles can be hydraulically unloaded every day or two and fresh fuel reloaded. The short fuel cycle allows HFPBR fuel loading to be very low, ~2 kg of ^{235}U, with a fission product inventory one-tenth of that in present high flux research reactors. The HFPBR can use partially enriched fuel, 20% ^{235}U, without degradation in flux reactivity. 8 refs., 12 figs., 2 tabs.

29785 **(N—86-16258) Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy.** Juhasz, A.J.; Bloomfield, H.S. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1985. 16p. (NASA-TM—87189; E—2668; CONF-850103—15). NTIS, PC A02/MF A01.

From 2. symposium on space nuclear power systems; Albuquerque, NM, USA (14 Jan 1985).

A combinatorial reliability approach is used to identify potential dynamic power conversion systems for space mission applications. A reliability and mass analysis is also performed, specifically for a 100 kWe nuclear Brayton power conversion system with parallel redundancy. Although this study is done for a reactor outlet temperature of 1100K, preliminary system mass estimates are also included for reactor outlet temperatures ranging up to 1500 K. 1 reference.

29786 **(N—86-16334) Thermal aging effects in refractory metal alloys.** Stephens, J.R. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 28p. (NASA-TM—87210; E—2869; CONF-860102—9). NTIS, PC A03/MF A01.

From 3. symposium on space nuclear power systems; Albuquerque, NM, USA (13 Jan 1986).

The alloys of niobium and tantalum are attractive from a strength and compatibility viewpoint for high operating temperatures required in materials for fuel cladding, liquid metal transfer, and heat pipe applications in space power systems that will supply from 100 kWe to multi-megawatts for advanced space systems. To meet the system requirements, operating temperatures ranging from 1100 to 1600 K have been proposed. Expected lives of these space power systems are from 7 to 10 yr. A program is conducted at NASA Lewis to determine the effects of long-term, high-temperature exposure on the microstructural stability of several commercial tantalum and niobium alloys. Variables studied in the investigation include alloy composition, pre-age annealing temperature, aging time, temperature, and environment (lithium or vacuum), welding, and hydrogen doping. Alloys are investigated by means of cryogenic bend tests and tensile tests. Results show that the combination of tungsten and hafnium or zirconium found in commercial alloys such as T-111 and Cb-752 can lead to aging embrittlement and increased susceptibility to hydrogen embrittlement of ternary and more complex alloys. Modification of alloy composition helps to eliminate the embrittlement problem.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 29747, 29753, 29848

29787 **(GAO/RCED—86-41) Nuclear regulation. Oversight of quality assurance at nuclear power plants needs improvement.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). Jan 1986. 54p. US General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI86901210.

Report to the Honorable Nunzio J. Palladino, Chairman, Nuclear Regulatory Commission.

The Nuclear Regulatory Commission (NRC) requires utilities operating nuclear power plants to have quality assurance programs in place so that safety equipment functions properly when called upon. The programs are a collection of management controls, policies, and procedures designed to minimize human errors and equipment problems that could jeopardize safety. Since the 1979 accident at Three Mile Island, however, there have been 40 incidents with safety implications serious enough to be reported, as required by law, to the Congress. Because of the important link between quality assurance and safe plant operations, GAO reviewed NRC's efforts to identify performance trends in the operation of nuclear plants that indicate the need for corrective action by utilities and require utilities to upgrade quality assurance programs when deficiencies are observed. The results of the study are reported along with the principal findings and recommendations to the NRC. 7 tabs.

29788 **(NUREG/CR—4568) Handbook for quick cost estimates. A method for developing quick approximate estimates of costs for generic actions for nuclear power plants.** Ball, J.R. (Argonne National Lab., IL (USA)). Apr 1986. Contract W-31-109-ENG-38. 122p. (ANL/EES-TM—297). NTIS, PC A06/MF A01 - GPO. File Number TI86009575.

This document is a supplement to a "Handbook for Cost Estimating" (NUREG/CR-3971) and provides specific guidance for developing "quick" approximate estimates of the cost of implementing generic regulatory requirements for nuclear power plants. A method is presented for relating the known construction costs for new nuclear power plants (as contained in the Energy Economic Data Base) to the cost of performing similar work, on a back-fit basis, at existing plants. Cost factors are presented to account for variations in such important cost areas as construction labor productivity, engineering and quality assurance, replacement energy, reworking of existing features, and regional variations in the cost of materials and labor. Other cost categories addressed in this hand-

book include those for changes in plant operating personnel and plant documents, licensee costs, NRC costs, and costs for other government agencies. Data sheets, worksheets, and appropriate cost algorithms are included to guide the user through preparation of rough estimates. A sample estimate is prepared using the method and the estimating tools provided.

2108 Economics

29789 **(NUREG—0020-Vol.10-No.3) Licensed operating reactors. Status summary report, data as of February 28, 1986. Volume 10, No. 3.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Resource Management). Apr 1986. 437p. NTIS, PC A19/MF A01 - GPO. File Number TI86901356.

This report is divided into three sections: the first contains monthly highlights and statistics for commercial operating units, and errata from previously reported data; the second is a compilation of detailed information on each unit, provided by NRC Regional Offices, IE Headquarters and the Utilities; and the third section is an appendix for miscellaneous information such as spent fuel storage capability, reactor years of experience and non-power reactors in the United States.

29790 **Local economic impacts associated with pure taxable capacity changes.** Bjornstad, D.J. (Oak Ridge National Lab., TN). *Land Economics;* 58: No. 1, 118-130(Feb 1982). Contract W-7405-ENG-26.

A fiscal-impact model based on the introduction of a nuclear power plant demonstrates the need to integrate local public-sector impacts with local private-sector impacts when estimating the economic changes a community undergoes in response to a significant exogenous shock. A nuclear plant differs from other electrical generating facilities because siting regulations require locating in a low-population density area where the influence on the community will be substantial. These characteristics approximate the pure fiscal capacity change or pure tax revenue importation concept. Four sections of the paper describe local decision making on taxes, identify the parameters that may shape local impact, analyze indifference curves as they integrate with the local macroeconomic model, and compare data for two communities in which both private and public local economic sectors show stimulation. 12 references, 1 figure.

22 NUCLEAR REACTOR TECHNOLOGY

29791 **(CONF-860415—4) TSORT - an automated tool for allocating tasks to training strategies.** Carter, R.J.; Jorgensen, C.C. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 14p. NTIS, PC A02/MF A01 - GPO. File Number TI86006070.

From International topical meeting on advances in human factors in nuclear power systems; Knoxville, TN, USA (21 Apr 1986).

An automated tool (TSORT) that can aid training system developers in determining which training strategy should be applied to a particular task and in grouping similar tasks into training categories has been developed. This paper describes the rationale for TSORT's development and addresses its structure, including training categories, task description dimensions, and categorization metrics. It also provides some information on TSORT's application.

29792 **(NUREG/CR—4436-Vol.2) Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2.** Triggs, T.J.; Rankin, W.L.; Badalamente, R.V.; Spanner, J.C. (Battelle Human Affairs Research Center, Seattle, WA (USA); Pacific Northwest Labs., Richland, WA (USA)). Mar 1986. Contract AC06-76RL01830. 133p. (PNL—5641-Vol.2; BHARC—400/85/016-Vol.2). NTIS, PC A07/MF A01 - GPO. File Number TI86008835.

This report documents a review of the research literature in the human factors, nondestructive testing (NDT), and related areas that was conducted to develop an understanding of how human performance in NDT can be improved through the application of human factors principles relating to task, training, procedural, individual difference, and environmental variables. A secondary purpose of this project was to develop a satisfactory measure of performance that can be applied in NDT. The report begins with an overview of NDT with special emphasis on ultrasonic testing for inservice inspection (UT/ISI) regarding intergranular stress corrosion cracking (IGSCC). Then, the strengths and weaknesses of typical measures of performance accuracy are discussed. Signal detection theory is then presented, and it is recommended that the relative operating characteristic (ROC) analysis, which follows from signal detection theory, be adopted for specifying human performance in NDT. Human performance in NDT and NDT-related areas is then discussed with respect to the five types of variables outlined above. This study strongly suggests that NDT technician performance could be improved through the systematic application of human factors principles within the framework of ROC analysis, especially in the areas of task, training, and, to a lesser extent, procedural variables. 215 references.

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 30944

29793 **(BNL-NUREG—37617) Geometry-independent approach to coarse-mesh neutron diffusion calculations.** Kohut, P. (Brookhaven National Lab., Upton, NY (USA)). Jan 1986. Contract AC02-76CH00016. 7p. (CONF-860610—14). NTIS, PC A02/MF A01 - GPO. File Number TI86006881.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

This summary describes the development of a boundary coarse-mesh nodal method applicable to arbitrary geometries using the boundary integral technique coupled with nodal source expansion. (JDB)

29794 **(CEA-R—5324) Versatile computer code for reactor neutronic calculation advances in qualification of the different modules.** Mourgues, A.; Doriath, J.Y.; Neviere, G.; Porta, J.; Tonolli, J. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Oct 1985. 255p. (In French). NTIS (US Sales Only), PC A12/MF A01. File Number DE86751341.

The last 12 years studies about the CABRI, SCARABEE and PHEBUS projects are summarized. It describes the object and the genesis of the cores, the evolution of the core concept and the associated neutronic problems. The calculational scheme used is presented, together with its qualification. The formalism, and the qualification of the different modules of GOLEM are presented. COXYS: module of physical analysis in order to determine the best energetic and spatial mesh for the case of interest. GOLU.B: input data management module. VAREC: calculation module of perturbations due to materials enables to compute perturbed flux and reactivity variation. VARYX: calculation module of geometric perturbations. TRACASYN: module of 3D power shape calculation. Finally TRACASTORE: module of management and graphic exploitation of results. Then, one gives utilization directions for these different modules. Qualification results show that GOLEM is able to analyse the fine physics of many various cases, to calculate by perturbation effects greater than 5000 pcm, to rebuild perturbed flux with margins near 3% for difficult situations, like reactor voiding or spectral or spectral variation in a PWR. Furthermore, 3D hot spots are calculated within margins of a magnitude comparable to experimental ones.

29795 **(LA—10645-PR) Radiation transport. Progress report, April 1, 1985-June 30, 1985.** O'Dell, R.D. (Los Alamos National Lab., NM (USA)). Mar 1986. Contract W-7405-ENG-48. 68p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009792.

Research and development progress in radiation transport by the Alamos National Laboratory's Group X-6 for the third quarter of FY 85 is reported. Included are unclassified tasks in the areas of Deterministic Radiation Transport, Monte Carlo Radiation Transport, and Cross Sections and Physics. 78 refs., 9 figs., 1 tab.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 29785, 29850, 29870, 30151

29796 (CONF-860675—1) Pressurized-thermal-shock experiments with thick vessels. Bryan, R.H.; Nanstad, R.K.; Merkle, J.G.; Robinson, G.C.; Whitman, G.D. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 3p. NTIS, PC A03/MF A01 - GPO. File Number TI86004821.

From 19. national symposium on fracture mechanics (ASTM); San Antonio, TX, USA (30 Jun 1986).

Information is provided on the series of pressurized-thermal-shock experiments at the Oak Ridge National Laboratory, motivated by a concern for the behavior of flaws in reactor pressure vessels having welds or shells exhibiting low upper-shelf Charpy impact energies, ~ 68J or less. (JDB)

29797 (DOE/DP/00789—T246) Qualification testing evaluation (QTE) program, FIN A-1051, Case 0686. Bimonthly status report, February-March 1986. (Sandia National Labs., Albuquerque, NM (USA)). 18 Apr 1986. Contract AC04-76DP00789. 16p. NTIS, PC A02/MF A01 - GPO. File Number TI86009627.

This report presents information on: accident methodologies assessments; accident environment effects; aging methodologies assessments; TMI-2 related activities; international programs coordination; research/facility definition; seismic methodologies; and related equipment qualification issues.

29798 (EUR—9679) Characterization of the pressure field induced by the explosion in air of a hydrocarbon-air a mixture with slow deflagration or fast deflagration. Brossard, J.; Desbordes, D.; Leyer, J.C.; Saint-Cloud, J.P.; Di Fabio, N.; Garnier, J.L.; Lannoy, A.; Perrot, J. (Commission of the European Communities, Luxembourg). 1985. 84p. (In French). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751326.

The protection of nuclear power plants against external explosions of hydrocarbons more particularly, originating, e.g. in transportation accidents, as a relevant topic of nuclear safety studies. The present research contract has been carried out in the framework of a French working group CEA-EDF-ENSMA. The "Charles" tests performed on completely unconfined charges of ethylene-air and acetylene-air mixtures (V approximately equal 12 m^3) have demonstrated the high sensitivity of the pressure field to the flame acceleration, particularly at the end of the propagation. The effect of a sudden discontinuity in the concentration of the combustible gas on the deflagration speed in a heterogeneous medium has been studied: this discontinuity was obtained using two concentric latex balloons, filled with different hydrocarbon concentrations and also destroyed before firing. The pseudo-detonation modes for the explosion of spherical ethylene-air mixtures, modes sought by increasing an explosive plastic mass associated to the igniter, have also been studied. The influence of cloud shape and ignition point location on the pressure field generated by the explosion has been tested finally.

29799 (FRADOC—2-1) Taking qualification requirements into account at the different levels of engineering. Nuclear qualification of electrical equipments. Raimondo, E. (Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)). 1985. 23p. (In French). (CONF-8404293—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751317.

From Seminar on nuclear qualification; Cadarache, France (25 Apr 1984).

After a recall of the part of FRAMATOME in the French nuclear qualification, the equipments to be qualified are briefly presented and the qualification process to follow is given.

29800 (NUREG/CR—4348-Vol.1) COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume I. Equations and numerics. (Argonne National Lab., IL (USA)). Sep 1985. Contract W-31-109-ENG-38. 174p. (ANL—85-42-Vol.1). NTIS, PC A08/MF A01 - GPO. File Number TI86005237.

The COMMIX-1B computer program is an extended version of COMMIX-1A with three major additions: (1) three more turbulence-model options for the computation of turbulent diffusivities, (2) a volume-weighted skew-upwind difference scheme to reduce numerical diffusion, and (3) a single formulation to combine semi-implicit and fully-implicit solution procedures. COMMIX-1B solves the conservation equations of mass, momentum, and energy, and transport equations of turbulence parameters. It is designed to perform steady-state/transient, single-phase, three-dimensional analysis of fluid flow with heat transfer in a single-component or a multicomponent system. The program is developed for the analysis of heat transfer and fluid flow processes in a nuclear reactor system. However, it is designed in a generalized fashion such that with no or minimal modification, it can be used to analyze processes in any engineering equipment, or in any system. This report describes in detail the basic equations, formulations, solution procedures, rebalancing scheme, and models to describe the auxiliary phenomena. 89 refs., 48 figs., 27 tabs.

29801 (NUREG/CR—4348-Vol.2) COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume II. User's manual. (Argonne National Lab., IL (USA)). Sep 1985. Contract W-31-109-ENG-38. 223p. (ANL—85-42-Vol.2). NTIS, PC A10/MF A01 - GPO. File Number TI86005238.

The COMMIX-1B computer program is an extended version of COMMIX-1A with three major additions: (1) three more turbulence-model options for the computation of turbulent diffusivities, (2) a volume-weighted skew-upwind difference scheme to reduce numerical diffusion, and (3) a single formulation to combine semi-implicit and fully implicit solution procedures. COMMIX-1B solves the conservation equations of mass, momentum, and energy, and transport equations of turbulence parameters. It is designed to perform steady-state/transient, single-phase, three dimensional analysis of fluid flow with heat transfer in a single component of a multicomponent system. The program is developed for the analysis of heat transfer and fluid flow processes in a nuclear reactor system. However, it is designed in a generalized fashion such that with no or minimal modification, it can be used to analyze processes in any engineering equipment, or in any system. An extension from COMMIX-1A to COMMIX-1B has been performed without altering the original format and structure of COMMIX-1A. Consequently, a COMMIX-1A user can run a COMMIX-1A problem on the COMMIX-1B version without any difficulty or changes in the input. This report contains the input instruction, sample problems, flow charts, and description of available options and boundary conditions. 22 refs., 54 figs., 24 tabs.

29802 (NUREG/CR—4380) Evaluation of the Motor-Operated Valve Analysis and Test System (MOVATS) to detect degradation, incorrect adjustments, and other abnormalities in motor-operated valves. Crowley, J.L.; Eissenberg, D.M. (Oak Ridge National Lab., TN (USA)). Jan 1986. Contract AC05-84OR21400. 324p. (ORNL—6226). NTIS, PC A14/MF A01 - GPO. File Number TI86005188.

As a part of the Nuclear Regulatory Commission Nuclear Plant Aging Research Program, a field test program was carried out to evaluate a technique of valve signature analysis to detect and differentiate abnormalities, including time-dependent degradation (aging) and incorrect adjustments in motor-operated valves. The technique described in this report in the Motor-Operated Valve Analysis and Test System (MOVATS), which is commercially available from MOVATS, Inc. In-situ signature traces were obtained on 36 motor-operated valves at 4 nuclear plant sites. Described are the test equipment package, method of obtaining the signatures, and determinations made as a result of analyzing these signatures. Based on evaluations of the signature-analysis technique

and on the results obtained from the field test program, the capabilities an limitations of MOVATS are discussed.

29803 **(NUREG/CR—4557) Review of issues related to improving nuclear power plant diesel generator reliability.** Higgins, J.C.; Czajkowski, C.J.; Tingle, A.G. (Brookhaven National Lab., Upton, NY (USA)). Apr 1986. Contract AC02-76CH00016. 221p. (BNL-NUREG—51969). NTIS, PC A10/MF A01 - GPO. File Number TI86007668.

The purpose of the report was to analyze the data and recommendations made by the various groups associated with nuclear power diesel generators and to summarize the major recommendations of each group. Those groups making recommendations included: nuclear utilities, industry organizations (such as INPO and ASME), DG manufacturers or vendors, foreign DG users, the Advisory Committee on Reactor Safeguards (ACRS), and some miscellaneous groups. The report presents those areas having broad documented support.

29804 **Stopped-flow technique for transit time measurement in a gas jet.** Rengan, K.; Lin, J.; Lim, T.; Meyer, R.A.; Harrell, J. (Lawrence Livermore National Lab., CA, USA. Nuclear Chemistry Div.; California Univ., Berkeley, USA. Dept. of Nuclear Engineering). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **242**: No. 1, 160-163(15 Dec 1985).

A 'stopped-flow' technique for the measurement of transit time of reaction products in a gas jet is described. The method involved establishing the gas flow through the jet system when the reactor is operating steadily and allowing the pressure to reach equilibrium values. The gas flow is stopped by means of electrically operated valves. The transit-time measurement is achieved by opening the valves and initiating the multiscanning of total activity simultaneously. The value obtained agrees well with the transit time measured by pulsing the reactor. The 'stopped-flow' technique allows on-line measurement of transit time in any gas jet system where the physical transportation time is the major component of the transit time. This technique is especially useful for systems installed in reactors which do not have pulsing capability.

2203 Fuel Elements

REFER ALSO TO CITATION(S) 29766

29805 **(CEA-CONF—8122) Cadarache - 20 years of plutonium fuels.** Guillet, H. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1985. 27p. (In French). (CONF-8509147—17). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751366.

From ACTINIDES '85; Aix-en-Provence, France (1 Sep 1985).

The qualitative and quantitative evolution of plutonium used is reviewed; more particularly, the isotopic composition of plutonium handled at the plutonium fuel fabrication plant of Cadarache has been considerably changing during these 20 last years. The evolution of fast neutron reactor fuel assemblies explains why the fabrication unit has to. The installations have been modified, as also the fuel assembly fabrication process. Changes can be classified in 3 categories: the transformations related to mass evolution, those related more particularly to the plutonium isotopic composition, finally those related to the waste treatment process. These transformations concerned workshops, apparatus and equipments, the reinforcement of protections, criticality accident prevention, and safeguards.

29806 **(CEA-CONF—8142) High temperature mass spectrometry study on fast-neutrons-nuclear-reactor irradiated fuel.** Philippot, J.; Pesme, O.; Fouilleul, R.; Laforet, J.J.; Semet, D.; Pattoret, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Sep 1985. 5p. (CONF-8509240—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751344.

From 10. international symposium on mass spectrometry; Swansea, UK (8 Sep 1985).

A special high-temperature mass spectrometer was built at DEC Pu-Far Nuclear Center in order to determine the thermodynamic properties of irradiated nuclear fuels, and to observe the release of gaseous species during a high rate of increase of temperature. The device built at CEN-FAR is described, and results obtained from the first experiments are briefly presented.

29807 **High resolution in situ ultrasonic corrosion monitor.** Grossman, R. J. (to The United States of America as represented by the United States Department of Energy). US Patent 4,539,846. 10 Sep 1985. Filed date 10 Jan 1984. vp.

PAT-APPL-569700.

An ultrasonic corrosion monitor is provided which produces an in situ measurement of the amount of corrosion of a monitoring zone or zones of an elongate probe placed in the corrosive environment. A monitoring zone is preferably formed between the end of the probe and the junction of the zone with a lead-in portion of the probe. Ultrasonic pulses are applied to the probe and a determination made of the time interval between pulses reflected from the end of the probe and the junction referred to, both when the probe is uncorroded and while it is corroding. Corresponding electrical signals are produced and a value for the normalized transit time delay derived from these time interval measurements is used to calculate the amount of corrosion.

29808 **Funnel for fuel pin loading system.** Christiansen, D. W.; Brown, W. F.; Steffen, J. M. (to The United States of America as represented by the United States Department of Energy). US Patent 4,537,741. 27 Aug 1985. Filed date 30 Nov 1982. vp.

PAT-APPL-445605.

An enlarged funnel is releasably mounted at the open end of a length of cladding by an encircling length of shrink tubing which securely engages outer surfaces of both the funnel and cladding. The shrink tubing overlaps an annular shoulder against which pulling force can be exerted to remove the tubing from the cladding. The shoulder can be provided on a separate collar or ring, or on the funnel itself.

2204 Control Systems

REFER ALSO TO CITATION(S) 29560, 29871

29809 **(CONF-860414—2) State and data techniques for control of discontinuous systems.** Kisner, R.A. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 21p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007240.

From 6. power plant dynamics, control and testing symposium; Knoxville, TN, USA (14 Apr 1986).

This paper describes a technique for structured analysis and design of automated control systems. The technique integrates control of continuous and discontinuous nuclear power plant subsystems and components. A hierarchical control system with distributed intelligence follows from applying the technique. Further, it can be applied to all phases of control system design. For simplicity, the example used in the paper is limited to phase 1 design (basic automatic control action), in which no maintenance, testing, or contingency capability is attempted. 11 figs.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 29351, 29368, 29369, 29370, 29381, 29384, 29387, 29391, 29392, 29778, 30570

29810 (CONF-850314—Vol.2, pp 417-422) **Project management of radwaste retrofits.** Vaught, D.L. (Duke Power Co., Charlotte, NC). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Many utilities are finding it necessary to provide additional radioactive waste processing facilities at operating or nearly completed nuclear stations in order to accommodate the ever-changing regulatory, political and socio-economic environment in which we operate. This paper describes the project approach taken at Duke Power Company to provide a comprehensive radioactive waste processing facility at Oconee Nuclear Station. Following a historical perspective which includes a brief description of the facility scope, the philosophy and mechanics of the project team are discussed. The goal of the project team was to provide a facility which could meet the liquid and solid radioactive waste processing needs of Oconee within the restraints of a utility budget and schedule. The unique quality of the project team approach was the integral involvement of all of the necessary departments in every part of the design, construction and start-up phases. The project team thereby utilized feedback from over thirty reactor years of operational experience. It is the lack of feedback from the ever-changing operation/regulatory arena that often renders new radwaste systems obsolete prior to operation. The remainder of the paper provides examples of the problems encountered and their resolution (e.g., equipment layout, materials handling, vendor improvements and regulatory changes all required design-in-progress changes). It has been the integration and concentration of the diverse resources of a large utility into a cross-departmental team which has allowed the timely resolution of the necessary changes. This same philosophy is being applied to the facility start-up program and to other major projects at Duke Power Company.

29811 (CONF-850314—Vol.2, pp 441-444) **Radwaste processing at the Advanced Test Reactor facility.** Beatty, R.N.; Livingston, R.A. (EG and G Idaho, Inc., Idaho Falls). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Advanced Test Reactor (ATR) is a 250-MW (thermal) water cooled reactor located at the Idaho National Engineering Laboratory. The reactor is used primarily to test materials in a radiation environment for defense related programs. Operation of this facility includes processing of radioactive waste streams in solid, liquid, and gaseous forms. Since the materials tested in reactor experiment facilities are sometimes destructively tested, the radwaste process capabilities for experimental facilities must be capable of handling a relatively wide range of contamination levels in the waste streams. Modifications to the original plant (designed in 1967) have been concerned with reducing the volume and activity level of liquid waste. Included are modular filtration and ion-exchange units that were developed to convert canal cleanup from an open loop flush to a closed loop recirculation system. Another plant improvement involved an ion-exchange treatment system that reduces the level of radiological contamination in the low level waste water. A system to evaporate the water from high level waste is presently in development, and is also discussed.

29812 (CONF-850314—Vol.2, pp 579-583) **Operational experiences of non-precoated type filters (super fine filter) in PWR and BWR nuclear power plants.** Koshiba, Y.; Nakatani, T.; Kuribayashi, H.; Kurosaka, N. (JGC Corp., Yokahama, Japan; JGC Corp., Oharai, Japan). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Precoated and cartridge type filters which are conventionally used in Japanese LWR nuclear power plants still have a disadvantage of generating a large amount of spent filter media as secondary waste. In addition to that, they are insufficient in separation performance and require frequent maintenance resulting into radiation exposure to personnel. In order to resolve these problems, the Super Fine Filter (SF filter) has been successfully developed and applied at many Japanese LWR nuclear power plants. This paper describes the results of the R and D work and operational experiences of the SF filter at nuclear power stations. 6 figs., 3 tabs.

29813 (SAND—86-0476C) **Coupling of aerosol removal mechanisms in rising bubbles.** Webb, S.W. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 6p. (CONF-860610—25). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007825.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

During many postulated severe accidents, especially BWR accidents, gas borne aerosols are vented through water pools. This process causes some of the aerosols to be removed by transfer from the gases to the water. This scrubbing effect generally can be divided into two major zones, the entrance region and the bubble rise region. This paper is concerned with aerosol removal in the bubble rise region only. This analysis of aerosol removal in a rising bubble considers four mechanisms. These mechanisms include three removal mechanisms consisting of sedimentation, inertial deposition, and Brownian diffusion. The fourth mechanism is the evaporation of water at the expanding bubble wall which tends to retard aerosol removal. In addition, the shape of the bubble will affect the aerosol removal rate. This paper examines three ways of combining the various deposition mechanisms with the retarding effect of the evaluation as well as two methods to correct for the bubble shape.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 29794, 29811, 29863, 29864, 29869

29814 (AEEW-R—404) **Reactivity change measurements on plutonium uranium oxide fuel clusters in a plutonium uranium metal lattice in HECTOR.** Tattersall, R.B. (UKAEA Atomic Energy Establishment, Winfrith. General Reactor Physics Div.). Jan 1965. 68p. Atomic Energy Establishment, Winfrith, Dorchester, Dorset, England. File Number TI86901245.

Previous reactivity change and manganese reaction rate measurements on plutonium uranium metal alloy fuel elements in HECTOR have been extended to oxide fuel clusters. Measurements have been made on elements with plutonium contents ranging from zero to 2%, and Pu240 to total plutonium ratios from 3% to 26%. The work described was carried out in a graphite moderated lattice fuelled with plutonium uranium alloy (0.25% plutonium) fuel on approximately an 8-inch pitch. Measurements were made with the lattice at room temperature and at about 430°C (700°K).

29815 (AEEW-R—423) **HECTOR measurements on plutonium-uranium metal fuel.** Richmond, R.; Bannerman, R.C.; Fripp, J.W.W.; Burbidge, B.L.H. (UKAEA Atomic Energy Establishment, Winfrith). May 1965. 68p. NTIS (US Sales Only), PC A04/MF A01. File Number DE86901184.

The HECTOR technique for deducing lattice parameters from measurements on single fuel elements has been applied to a range of plutonium-uranium metal rods. Elements containing up to 1/2% of plutonium with Pu240 contents in the range 3 to 24% were used, the compositions being chosen to allow the effects of Pu239 and Pu240 to be separated. An element containing a nonuniform radial distribution of plutonium was included in the series and a measurement was also made on a Calder fuel element irradiated to a level of 4500 MWD/Te. Except in the case of the irradiated element, measurements were made both at room temperature and at a temperature in the range 400 to 430°C. The results of the measurements were compared with the predictions of the TRACER and ARGOSY 2A methods of lattice calculation. It was found that the values of k/sub infinity/ given by both methods of calculation were in reasonable agreement with the measured values.

29816 (CEA-CONF—8153) **Research program and uses of the solution fueled reactor SILENE.** Barbry, F.; Ratel, R. (CEA Centre d'Etudes de Valduc, 21 - Is-sur-Tille (France)). Sep 1985. 16p. (In French). (CONF-850932—2; DERS-SRSC—181). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751362.

From Seminar on applied research and service activities for research reactor operations; Copenhagen, Denmark (9 Sep 1985).

Designed and operated by the Nuclear Protection and Safety Institute of the CEA, SILENE is an original small sized reactor

fueled with an uranyl nitrate solution. The reactor is capable to operate in three modes: "Pulse" operation (high power levels up to 1000 Megawatts during several millisecond), "Free evolution" operation (simulation of criticality accident excursions), "Steady state" operation in a power range of 0.01 W to 1 kW. The core can be surrounded by appropriate shields (lead, polyethylene) to vary the leakage radiations and the gamma to neutron dose ratio. It's possible to insert in the central cavity of the annular core vessel some capsules, devices or samples to be submitted to very high radiations levels. The research activities are mainly devoted towards nuclear safety studies: the criticality accident studies, and the behavior of oxide fuels under transient conditions. Some examples of tests are presented. As to other applications of the SILENE facility, the main studies now in progress deal with: designing and calibration of Health physics intrumentation, neutron and gamma dosimetry, and, radiobiology. Once the characteristics of radiation field are qualified by calculations and experimental techniques, SILENE will be proposed as a reference source.

29817 **(CONF-860414—3) Description of a research reactor control system using a programmable controller.** Battle, R.E. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 10p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007156.

From 6. power plant dynamics, control and testing symposium; Knoxville, TN, USA (14 Apr 1986).

This paper describes the design features, testing methods, and operational experience of a programmable controller (PC) installed as a neutron flux controller in the Oak Ridge Research Reactor (ORR) at Oak Ridge National Laboratory (ORNL). The PC was designed to control neutron flux from 1 to 105% for three selectable ranges. The PC generates a flux setpoint under operator control, calculates the reactor heat power from flow and temperature signals, calculates a neutron flux calibration factor based on the heat power, and positions a control rod based on the flux-setpoint difference. The programmable controller was tested by controlling an analog computer model of the ORR. The equipment was installed in August 1985, and except for some startup problems, the system has performed well.

29818 **(CONF-860605—3) Characterization of the National Low-Temperature Neutron Irradiation Facility.** Kerchner, H.R.; Coltman, R.R. Jr.; Klabunde, C.E.; Young, F.W. Jr. (Oak Ridge National Lab., TN (USA)). Feb 1986. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007238.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

The National Low-Temperature Neutron Irradiation Facility (NLTNIF) is now operating at the Bulk Shielding Reactor at ORNL. The facility provides high radiation intensities and special environmental and testing conditions for qualified experiments at no cost to users. A general description and major specifications of the NLTNIF are presented along with the results of performance tests. In addition, the hardware and other considerations required to perform experiments in the NLTNIF are described.

29819 **(EUR—9651) Probabilistic analysis of the events: loss of electric power supply of the secondary coolant circuit pump related to the busbar AL1 AL2 and loss of power supply of the busbar ML1 ML2 of the primary coolant circuit of the SORA reactor.** Francocci, G.F.; Marcolli, C.F. (Commission of the European Communities, Ispra (Italy). European Scientific Data Processing Center; Commission of the European Communities, Luxembourg). 1985. 37p. (In Italian). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751325.

The aim of this work is to set up the reliability analysis for the safety evaluation and the critical revision of the project. The project consists of three parts. The first of them illustrates the methodology used for the analysis, that is: the fault-tree method; analysis methods for "critical sets"; the critical used in choosing the computing codes and the failure and repair laws. In the second part the system analysis for "cut sets" without probability values is developed. In the last part a quantitative evaluation of the probability with and without restoration times is given. Finally, some conclusions about the project are proposed.

29820 **(EUR—10194) High flux testing reactor Petten. Replacement of the reactor vessel and connected components. Overall report.** Chrysochoides, N.G.; Cundy, M.R.; Von der Hardt, P.; Husmann, K.; Swanenburg de Veye, R.J.; Tas, A. (Commission of the European Communities, Luxembourg). 1985. 135p. NTIS (US Sales Only), PC A07/MF A01. File Number DE86751610.

The project of replacing the HFR originated in 1974 when results of several research programmes confirmed severe neutron embrittlement of aluminium alloys suggesting a limited life of the existing facility. This report contains the detailed chronology of events concerning preparation and execution of the replacement. After a 14 months' outage the reactor resumed routine operation on 14th February, 1985. At the end of several years of planning and preparation the reconstruction proceded in the following steps: unloading of the old core, decay of short-lived radioactivity in December 1983, removal of the old tank and of its peripheral equipment in January-February 1984, segmentation and waste disposal of the removed components in March-April, decontamination of the pools, bottom penetration overhauling in May-June, installation of the new tank and other new components in July-September, testing and commissioning, including minor modifications in October-December, and, trials runs and start-up preparation in January-February 1985. The new HFR Petten features increased and improved experimental facilities. Among others the obsolete thermal columns was replaced by two high flux beam tubes. Moreover the new plant has been designed for future increases of reactor power and neutron fluxes. For the next three to four years the reactor has to cope with a large irradiation programme, claiming its capacity to nearly 100%.

29821 **(NUREG/CR—3064-Vol.2) Computational methodology for the Oak Ridge Research Reactor (ORR) and Bulk Shielding Reactor (BSR): the VICTORR input processing code for the BOLD VENTURE system. Volume 2.** Williams, M.L.; Miller, L.F. (Oak Ridge National Lab., TN (USA)). Apr 1986. Contract AC05-84OR21400. 66p. (ORNL/TM—9968-Vol.2). NTIS, PC A04/MF A01 - GPO. File Number TI86009493.

This report is the second volume in a two-volume set which describes the development of a standardized computational methodology for analyzing the neutron environment in the Oak Ridge Research Reactor (ORR) and the Bulk Shielding Reactor (BSR). The first volume describes the development of a standard seven-group cross-section library based on ENDF/B-V data which has been tailored specifically for analyses of these reactors. The VICTORR (VENTURE Input Code for Treating Oak Ridge Reactors) program prepares input for neutronics calculations based on the BOLD VENTURE computational system. The VENTURE module in this system is a multigroup, three-dimensional (3-D) diffusion theory code, which performs core physics analyses of complete reactor configurations. However, the VENTURE input for defining complex 3-D problems is very involved and time consuming to prepare, even for the experienced user; for the novice, the burden of input preparation to VENTURE can be overwhelming. Thus, VICTORR was written to serve as an input processing code which requires very little input from the user in order to prepare a complicated 3-D VENTURE model for the two Oak Ridge reactors, ORR and BSR, as well as to verify the accuracy of the model. From the user's point of view, the VICTORR-VENTURE calculation is automated so that only the input to VICTORR is required to obtain the VENTURE results.

29822 **(SAND—85-2103C) Remote maintenance robot system for a pulsed nuclear reactor.** Thunborg, S. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1985. Contract AC04-76DP00789. 23p. (CONF-860434—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86000206.

From IEEE international conference on robotics and automation; San Francisco, CA, USA (14 Apr 1986).

This paper presents a remote maintenance robot system for use in a hazardous environment. The system consists of turntable, robot and hoist subsystems which operate under the control of a supervisory computer to perform coordinated programmed maintenance operations on a pulsed nuclear reactor. The system is oper-

ational and the oral presentation will include a videotape of the system in operation.

29823 **(SAND—85-2152C) Sensor-driven, fault-tolerant control of a maintenance robot.** Moya, M.M.; Davidson, W.M. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 23p. (CONF-860434—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86002118.

From IEEE international conference on robotics and automation; San Francisco, CA, USA (14 Apr 1986).

A robot system has been designed which will perform routine maintenance tasks on the Sandia Pulsed Reactor (SPR). The use of this Remote Maintenance Robot (RMR) is expected to significantly reduce the occupational radiation exposure of the reactor operators. Reactor safety was a key issue in the design of the robot maintenance system. Using sensors to detect error conditions and intelligent control to recover from the errors, the RMR is capable of responding to error conditions without creating a hazard. This paper describes the design features and implementation methods used to create sensor-driven, fault-tolerant control of the RMR. Features which make the system more tolerant to error conditions include the following: mechanical tolerances, continuous monitoring of force sensors, monitoring of verification switches, index point referencing, spiral searching with force feedback, and operator supervision. The paper also describes the mechanisms for error recovery. Error recovery is not automatic; it does rely on operator assistance. However, a key feature of the error recovery procedure is that the operator is allowed to reenter the programmed operation after the error has been corrected. The recovery procedure guarantees that the moving components of the system will not collide with the reactor during recovery.

2207 Plutonium And Isotope Production Reactors

REFER ALSO TO CITATION(S) 29820

2208 Propulsion Reactors

29824 **(BNL—37930) Particle bed reactor propulsion vehicle performance and characteristics as an orbital transfer rocket.** Horn, F.L.; Powell, J.R.; Lazareth, O.W. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 24p. (CONF-860102—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009944.

From 3. symposium on space nuclear power systems; Albuquerque, NM, USA (13 Jan 1986).

The particle bed reactor designed for 100 to 300 MW power output using hydrogen as a coolant is capable of specific impulses up to 1000 seconds as a nuclear rocket. A single space shuttle compatible vehicle can perform extensive missions from LEO to 3 times GEO and return with multi-ton payloads. The use of hydrogen to directly cool particulate reactor fuel results in a compact, lightweight rocket vehicle, whose duration of usefulness is dependent only upon hydrogen resupply availability. The LEO to GEO mission had a payload capability of 15.4 metric tons with 3.4 meters of shuttle bay. To increase the volume limitation of the shuttle bay, the use of ammonia in the initial boost phase from LEO is used to give greater payload volume with a small decrease in payload mass, 8.7 meters and 12.7 m-tons. 5 refs., 15 figs.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 29820, 30070, 30309, 30310, 30361, 30562, 31279

29825 **(BNL-NUREG—37612) Effects of rod worth and drop speed on the BWR off-center rod drop accident.** Cokinos, D.M.; Carew, J.F. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 6p. (CONF-860610—15). NTIS, PC A02/MF A01 - GPO. File Number TI86006883.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

The purpose of the present study was to determine the effect of increasing the control rod worth and the rod drop speed on the off-center RDA. An increase in either of these parameters results in an increase in peak core power and fuel enthalpy, and the objective of this study is to determine the margin to the fuel damage threshold.

29826 **(BNL-NUREG—37615) Analysis of high pressure boil-off situation during MSIV closure ATWS in a typical BWR/4.** Neymotin, L.Y.; Slovik, G.C.; Saha, P. (Brookhaven National Lab., Upton, NY (USA)). Jan 1986. Contract AC02-76CH00016. 7p. (CONF-860610—13). NTIS, PC A02/MF A01 - GPO. File Number TI86006880.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

The objective of this paper is to provide a best-estimate analysis of the MSIV Closure ATWS in the Browns Ferry Unit 1 BWR with Mark 1 containment. The calculations have been performed using the RAMONA-3B code which has a three-dimensional neutron kinetics model coupled with one-dimensional (multichannel core representation), four-equation, nonhomogeneous, nonequilibrium thermal hydraulics. The code also allows for one-dimensional neutronic core representation. The 1-D capability of the code has been employed in this calculation since a thorough sensitivity study showed that for a full ATWS, a one-dimensional (axial) neutron kinetics adequately describes the core behavior. (Note that the core steady-state symmetry in this case was preserved throughout the transient so that radial effects could be neglected.) The calculation described in the paper was started from a steady-state fuel condition corresponding to the end of Cycle 5 of the Browns Ferry reactor.

29827 **(BNL-NUREG—37616) Simulation of FIST tests using TRAC-BD1/MOD1.** Jo, J.H.; Connell, H. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 5p. (CONF-860610—12). NTIS, PC A02/MF A01 - GPO. File Number TI86006879.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

Several FIST tests were simulated using the TRAC-BD1/MOD1 code at Brookhaven National Laboratory. The FIST (Full Integral Simulation Test) program is a joint project of the NRC, Electric Power Research Institute and General Electric. It was built to investigate small break LOCA and operational transients in BWRs and to complement earlier large break LOCA test results from TLTA (Two-Loop Test Apparatus). The facility is a BWR integral test facility with a full BWR height but volume scaled to 1/624 to the BWR/6 vessel. It has all the prototypical components of a BWR/6 but contains a single electrically heated full-size BWR fuel bundle. The flow areas and fluid volumes in all regions are closely scaled to 1/624. However, because of scaling difficulty, the test facility has a cylindrical external downcomer connected to the main vessel. The FIST tests consist of two phases (Phase I and Phase II) and the Phase I consists of ten tests. Among these, four tests were selected to be simulated in this study. They were: a BWR/4 MSIV closure ATWS (Test 4PMC1), a BWR/6 small break LOCA without HPCS (6SB2C), a BWR/6 large break LOCA (6DBA1B), and a BWR/6 main steam line break test (6MSB1).

29828 **(BNL-NUREG—37705) Plant analyzer development for high-speed interactive simulation of BWR plant transients.** Wulff, W.; Cheng, H.S.; Mallen, A.N. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 10p. (CONF-860454—4). NTIS, PC A02/MF A01 - GPO. File Number TI86007137.

From 2. international topical meeting on nuclear power plant thermal hydraulics and operations; Tokyo, Japan (15 Apr 1986).

Advanced modeling techniques have been combined with modern, special-purpose peripheral minicomputer technology to develop a plant analyzer which provides realistic and accurate predictions of plant transients and severe off-normal events in nuclear power plants through on-line simulations at speeds of approximately 10 times faster than actual process speeds. The new simulation technology serves not only for carrying out routinely and efficiently safety analyses, optimizations of emergency procedures and

design changes, parametric studies for obtaining safety margins and for generic training but also for assisting plant operations. Five modeling principles are presented which serve to achieve high-speed simulation of neutron kinetics, thermal conduction, nonhomogeneous and nonequilibrium two-phase flow coolant dynamics, steam line acoustical effects, and the dynamics of the balance of plant and containment systems, control systems and plant protection systems. 21 refs.

29629 **(BNL-NUREG—37869) Independent analysis of selected core-concrete interaction and fission product release experiments with CORCON-MOD2 and VANESA.** Greene, G.A.; Sanborn, Y. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 11p. (CONF-860204—40). NTIS, PC A02/MF A01. File Number TI86009430.

From Thermal reactor safety meeting; San Diego, CA, USA (2 Feb 1986).

The discrepancies between experimental findings and the Reactor Safety Study predictions, as well as the rapidly developing data base enabling phenomenological modeling of core-concrete interactions and ex-vessel fission product release, have prompted the development of several new computer models of core-concrete interactions and fission product release during severe accidents. Two such models are the CORCON-MOD2 model of core-concrete interactions and the VANESA model of ex-vessel aerosol and fission product release during core-concrete interactions. The final judge on the adequacy of the development of models of core debris-concrete interactions is, of course, comparison of the model predictions with the results of experiments. The research into ex-vessel core debris behavior differs from research into many aspects of reactor accidents in that there are many experimental results for comparison. Comparisons of code predictions with results of tests using realistic temperatures and conditions should provide an indication of the progress that has been made and, with appropriately chosen tests, an indication of work that needs to be done. 9 refs., 6 figs., 5 tabs.

29630 **(BNL-NUREG—37940) Cost-effectiveness studies as part of an ALARA program.** Baum, J.W. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 24p. (CONF-8604166—1). NTIS, PC A02/MF A01 - GPO. File Number TI86009941.

From Edison Electric Institute Health Physics Committee spring meeting; Myrtle Beach, SC, USA (14 Apr 1986).

Recent studies of cost effectiveness of engineering modifications for dose reduction at nuclear power plants conducted at BNL will be considered in this report. Since each of these items has the potential for a 50% to 60% reduction in collective dose, it appears there is large potential for dose reduction from engineering type modifications. The question that must be answered for each plant is "which modifications or improvements are required for optimization (ALARA). The purpose of this paper is to illustrate that quantified optimization need not be costly and can often be highly beneficial.

29631 (CONF-850314—Vol.2, pp 269-270) **Institutional agreements and interaction for research and disposition of nuclear waste from Three Mile Island.** Reilly, J.K.; McIntosh, T.W.; McGoff, D.J.; Grant, P.J.; Barrett, L.H. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Various institutional agreements were made for the research and disposition of nuclear wastes from the Three Mile Island accident. The wastes provided opportunities for useful research and development toward commercial disposition. Interaction among the participating institutions occurred in the spirit of cooperation. Of particular importance were the participation by area citizens in the monitoring of krypton-85 and cooperation of government agencies in the task.

29632 (CONF-850314—Vol.2, pp 271-275) **Processing and removal of the Three Mile Island makeup and purification system resins.** Reilly, J.K.; McIntosh, T.W.; Northey, L.M.; Galanto, J.J.; Osterhoudt, T.R.; Thompson, J.D. 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The accident at Three Mile Island Unit 2 in March 1979 left the makeup and purification demineralizers inaccessible to workers. These demineralizers contained the highest concentrations of radioactive isotopes outside the Reactor Building. Additionally, unknown quantities of fuel were in the demineralizers. Other concerns centered on the unknown condition of the demineralizer resins, the possible loss of system integrity, and the presence of hydrogen due to the radiolytic breakdown of water contained in the demineralizers. GPU Nuclear, with the US Department of Energy and its contractors EG and G Idaho, Inc., Oak Ridge National Laboratory, and Westinghouse Hanford Company, remotely measured the fuel and fission product inventory of the demineralizers and demonstrated a practical chemical processing method using samples acquired from the demineralizers. Equipment was developed and installed to elute the radioactive cesium from the demineralizers. And elution, which began in September 1984, now nears completion.

29633 **(DOE/OR/21400—T258) Nuclear plant aging research program activities.** Eissenberg, D.M. (Oak Ridge National Lab., TN (USA)). 1 Apr 1986. Contract AC05-84OR21400. 24p. NTIS, PC A02/MF A01 - GPO. File Number TI86008890.

The objective of this program is to provide recommendations for use by NRC regarding the availability and capability of diagnostic methods for assuring the operational readiness of NPP safety systems and components.

29634 **(EGG-M—18085) System Analysis and Risk Assessment (SARA) system.** Krantz, E.A.; Russell, K.D.; Stewart, H.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1986. Contract AC07-76ID01570. 7p. (CONF-860684—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009079.

From 13. Inter-RAM: international reliability, availability and maintainability conference for the electric power industry; Syracuse, NY, USA (2 Jun 1986).

Utilization of Probabilistic Risk Assessment (PRA) related information in the day-to-day operation of plant systems has, in the past, been impracticable due to the size of the computers needed to run PRA codes. This paper discusses a microcomputer-based database system which can greatly enhance the capability of operators or regulators to incorporate PRA methodologies into their routine decision making. This system is called the System Analysis and Risk Assessment (SARA) system.

29635 **(EUR—9862) Study of explosive demolition techniques for heavy reinforced and prestressed concrete structures.** Fleischer, C.C. (Commission of the European Communities, Luxembourg). 1985. 130p. NTIS (US Sales Only), PC A07/MF A01. File Number DE86751641.

This report presents the results from a research programme aimed at advancing explosive demolition techniques from the present "rule of thumb art" to a more scientifically based set of procedures to achieve the degree of control which will be essential in a nuclear power station decommissioning. The research is directed mainly at the biological shields of early Magnox reactors and the prestressed concrete pressure vessels (PCPVs) of later Magnox and advanced gas-cooled reactors. Relevant structures of other commercial nuclear power plants in the European Community, in particular the PCPVs of French gas graphite reactors and the biological shields of light water reactors are also considered. The bulk of the programme has been based on experiments with an extensive usage of scaled models. The programme investigated the use of buried explosive charges in cratering concrete and the use of shaped charges in stripping surface cover and drilling holes. After an initial parametric study the programme considered concrete layer stripping using multiple charges and culminated in the stripping off of an equivalent thickness of concrete, for radiation protec-

tion, from the inside walls of a complete cylindrical model of a biological shield. 6 tables, 66 figs., 11 refs.

29836 **(EUR—10074) Heat transfer to a dispersed two phase flow and detailed quench front velocity research.** De Boer, T.C.; Van der Molen, S.B. (Commission of the European Communities, Luxembourg). 1985. 624p. NTIS (US Sales Only), PC A99/MF A01. File Number DE86780451.

During the blow-down phase of a loss of coolant accident (LOCA) in a pressurized water reactor the core will heat up dramatically. Water will be injected in the system, and by bottom flooding the core will be cooled. The use of one-dimensional computer models for the calculation of the reflood process in a bundle needs a better justification. The influence of an unheated shroud on prequench heat transfer is investigated in a tube, an annulus and a 4 rod bundle. By using a glass shroud for the annulus, optical analysis of the dispersed two-phase flow regime has been performed. The ECN 36-rod bundle tests as performed with axial uniform power profile are reflood and boil-down at 0.2 MPa pressure executed for different conditions. The experiment yield a data base suitable for code validation and development. Better understanding is obtained for the influence of the radial non-uniform temperature and/or power distributions on the reflood process. Heat transfer improvement induced by the presence of spacer grids is observed. 72 refs.; 220 figs.

29837 **(EUR—10076) Study of two-dimensional effects in the core of a light water reactor during the ECC'S phase following a loss of coolant accident.** Deruaz, R.; Clement, P.; Veteau, J.M. (Commission of the European Communities, Luxembourg). 1985. 200p. NTIS (US Sales Only), PC A09/MF A01. File Number DE86780453.

In a PWR core the power is not identical from an assembly to another and this may result in 2D phenomena which have to be studied in order to know whether it is necessary to take them into account in safety codes or not and, if yes, to define the simplest models suitable for that. An experimental programme has been conducted during which the main aspects were investigated. Boil up and reflood tests (constant and oscillating flow rate) have been performed which show the effect of various parameters and somewhat clarify the problem of fall back and cross flows as well as their consequences on quench front propagation and heat transfer in the dry region. 5 refs., 123 figs.

29838 **(EUR—10077) Analysis of zircaloy rewetting experiments and their implication for reactor fuel.** Blackburn, D.; Green, C.; Grigg, A. (Commission of the European Communities, Luxembourg). 1985. 74p. NTIS (US Sales Only), PC A04/MF A01. File Number DE86751645.

This report describes the analysis of single-tube rewetting experiments in the Reflex rig. The primary aim was to apply the Grenoble k_3-rewetting model to study rewetting of zircaloy tubes with controlled oxide-layers up to 75 μm thick and develop a correlation of the parameter k_2 and assess the implication of these experiments to reactor fuel. In the absence of a two-dimensional conduction code at Winfrith containing the k_3-heat flux boundary condition, it was decided to modify three existing codes TRAC-PD2, QUENCH and REWET to incorporate such a boundary condition, the first being a transient code and the others quasi-steady-state. All three codes are now satisfactorily validated and have contributed to the analysis of the REFLEX data. It was found that the Grenoble correlation for k_2 was unable to predict the data particularly at the lower powers and sub-coolings. A new correlation has therefore been developed which involves the rewetting temperature as well as the system variable pressure, mass flow rate and sub-cooling at the quench front. In the higher power ERSEC experiments at Grenoble the new correlation should reduce to the original k_3-correlation as the rewetting temperatures are thought to be nearly constant. The code(s) have also been used to study the effect of gas-gap and oxide layers on PWR fuel-pin rewetting. 19 refs., 20 figs.

29839 **(EUR—10078) Experimental investigation of the effect of clad ballooning on the effectiveness of PWR emergency cooling.** Cooper, C.A.; Pearson, K.G.; Jowitt, D. (Commission of the European Communities, Luxembourg). 1985. 540p. NTIS (US Sales Only), PC A23/MF A01. File Number DE86780454.

A series of single phase cooling, forced reflood, gravity reflood and level swell experiments has been performed on a full length, electrically heated 7 x 7 rod fuel cluster (in the THETIS Rig) containing a blockage simulating very severe clad ballooning. The single phase cooling experiments provided data on the level of heat transfer within the cluster and the enhancement produced by turbulence created by the spacer grids. The forced reflood experiments have led to a better understanding of the rewetting processes during bottom reflooding, the very important influence of spacer grids in two-phase flow and the complicated heat transfer processes within the blockage. The insight obtained has been used to develop a mechanistic model. The gravity reflood experiments investigated steam binding and inlet flow oscillation effects. The variation in inlet flow produced by the variations in system parameters was the dominant influence. The inlet flow oscillations which occurred in gravity reflood appeared not to influence overall rewetting or heat removal performance. The level swell experiments investigated the relationship between void fraction and superficial steam velocity at pressures up to 40 bar and compared the data with various correlations. The correlation of Gardner was found to be most satisfactory. 107 refs., 252 figs.

29840 **(EUR—10079-Vol.1) Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 1.** Fairbairn, S.A.; Piggott, B.D.G. (Commission of the European Communities, Luxembourg). 1985. 718p. NTIS (US Sales Only), PC A99/MF A01. File Number DE86780455.

Ballooning of the zircaloy cladding of PWR fuel pins could occur during certain postulated Loss of Coolant Accidents. This report describes experimental data obtained in a 44-rod bundle with and without a localized coplanar blockage under conditions relevant to the reflood phase of a LOCA. The aim of the work is to provide a data base for modelling dispersed flow heat transfer around a local blockage. This work concentrates on the thermohydraulic aspects of the ballooning problem by use of pre-formed balloon shapes attached to the rods of an electrically heated rod bundle. The various thermohydraulic effects are investigated separately, as far as possible, in a unique series of tests of increasing complexity proceeding from single to two phase conditions as follows: isothermal air flow tests, used to infer the single phase mass flow distribution; steady state steam flow tests, used to quantify single phase heat transfer; steam and droplet tests, in which a dispersed flow of well specified inlet conditions is created by injecting water droplets into the subchannel centres between the rods with a co-current steam flow; and finally, conventional reflood tests. The first part makes an extensive presentation of all the data obtained for an undistorted bundle and a bundle containing a centrally placed 4 x 4 array of balloon shapes (approximately 50 mm long, solid) which create a 90% subchannel blockage at their centre elevations. In part 2 tests on two blockage shapes each producing 90% subchannel blockage are described. The first shape is composed of thick walled sleeves (1.0 to 2.5 mm) and the second of sleeves with a more realistic thermal capacity being only about 0.3 mm thick. 48 refs., 335 figs.

29841 **(EUR—10079-Vol.2) Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 2.** Fairbairn, S.A.; Piggott, B.D.G. (Commission of the European Communities, Luxembourg). 1985. 189p. NTIS (US Sales Only), PC A09/MF A01. File Number DE86780456.

Ballooning of the zircaloy cladding of PWR fuel pins could occur during a conservatively calculated large break LOCA. This report is Part 3 of three reports which describe the experimental data obtained in a 44 rod bundle with and without localised coplanar blockages under conditions relevant to the reflood phase of a LOCA. The various thermohydraulic effects are investigated separately, as far as possible, in a unique series of tests of increasing complexity proceeding from single to two phase conditions as follows: isothermal air flow tests, used to infer single phase mass flow distribution; steady state steam flow tests, used to quantify single phase heat transfer; steam and drop tests, in which a dispersed flow of well specified inlet conditions is created by injecting water drops into the subchannel centres between the rods with a co-current steam flow; and finally conventional reflood tests. This report makes an extensive presentation of data obtained from a bundle containing a centrally placed 4 x 4 array of balloon shapes. The bal-

loon sleeves were hydraulically formed to give a wall thickness of 0.325 mm typical of reactor fuel pin balloons. They were 196 mm long with a maximum subchannel blockage of 61% over a 175 mm length. 6 refs., 15 tabl., 134 figs.

29842 **(EUR—10165) Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding.** Hawighorst, A.; Kroening, H.; Mewes, D.; Spatz, R.; Mayinger, F. (Commission of the European Communities, Luxembourg). 1985. 311p. NTIS (US Sales Only), PC A14/MF A01. File Number DE86751611.

During the refilling and reflooding phase following a hypothetical loss of coolant accident in lightwater cooled nuclear reactors, there will be countercurrent flow between discharging steam and the feed of emergency core cooling water. It was the objective of this research project to contribute to a better physical understanding of the fluid-dynamic processes in the area of the fuel element top nozzle and so to improve emergency core cooling calculations. Therefore, experimental and theoretical investigations about the entrainment and countercurrent behaviour of gas/liquid flows have been implemented within this project. Fluid-dynamic processes in the fuel element top nozzle area were simulated during the reflooding and refilling phase. Based on special internals as single and multiple-hole orifices, basic phenomena of fluid-dynamics were studied first with air-water. Subsequently, investigations of the system steam/water were conducted. The reactor geometry was approximated step by step, until a complete reactor fuel assembly top nozzle was constituted. The system pressure was 4.8 bars (abs), in accordance with the conditions in the reactor pressure vessel at the end of the blowdown phase. The water was initially fed in at saturation temperature, then, as a second step, fed in at subcooled condition relative to the steam temperature, in order to be able to study condensation effects as well. First, investigations on gas/liquid countercurrent flows in the fluid system air/water are presented. Then one studies countercurrent flow in the system steam/water, including the investigation of condensation effects. Finally, a detailed description of the research on droplet size determination is given.

29843 **(GEND—055) US Department of Energy Three Mile Island research and development program. 1985 annual report.** Brown, G.R. (ed.). (EG and G Idaho, Inc., Idaho Falls (USA)). Apr 1986. Contract AC07-76ID01570. 41p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86009454.

In 1985, the US Department of Energy's Three Mile Island Research and Development Program at Three Mile Island Unit 2 (TMI-2), the Idaho National Engineering Laboratory, and other supporting laboratories, concentrated on three major areas: fuel and waste handling and disposition, accident evaluation, and reactor evaluation. While the general technology being developed is of direct benefit to the recovery operations at TMI-2, this technology will be of generic benefit to the entire nuclear power industry. Others engaged in research and development, design, construction, operation, maintenance, and regulation of nuclear plants will have access to this technology to enhance plant safety and reliability.

29844 **(LA-UR—85-3958) Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility.** Cappiello, M.; Spore, J. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 12p. (CONF-860454—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86003681.

From 2. international topical meeting on nuclear power plant thermal hydraulics and operations; Tokyo, Japan (15 Apr 1986).

TRAC-PF1/MOD1 is compared to a no-failure upper plenum injection reflood test in the Cylindrical Core Test Facility. The results show that TRAC can accurately predict the asymmetric channeling of fluid from upper plenum into the core and that a multidimensional modeling capability is required to do so. The rod temperature behavior is accurately predicted for both the peak cladding temperature and the quench time in the high- and low-power zones. Excessive downflow of liquid at the tie plate is predicted as a result of the interfacial drag model used in TRAC. 10 figs.

29845 **(LA-UR—85-3959) TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel.** Spore, J.W.; Cappiello, M.W. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 10p. (CONF-860454—2). NTIS, PC A02/MF A01 - GPO. File Number TI86003680.

From 2. international topical meeting on nuclear power plant thermal hydraulics and operations; Tokyo, Japan (15 Apr 1986).

This report presents the results of a TRAC-PF1/MOD1 calculation that simulated a 200% double-ended cold-leg-break loss-of-coolant accident in a generic US/Japanese pressurized water reactor. This is a best-estimate analysis using conservative boundary conditions and minimum safeguards. The calculation shows that the peak cladding temperature (PCT) occurs during blowdown and that the core reheat is minimal during reflood. The results also show that for an evaluation-model peak rod linear power of 15.85 kW/ft, a PCT of 1084 K is reached at 3.5 s into the blowdown transient, which is ~394 K below the design basis limit of 1478 K. 10 figs.

29846 **(NP—6901285) Analysis of the certification process of computer programs used in a nuclear power plant, using the management systems approach.** Egan, L.G. Jr. (California Coast Univ., Santa Ana (USA)). Dec 1983. 431p. Software Certification Institute, Box 2328, Santa Maria, CA 93455. File Number TI86901285.

Thesis.

This dissertation concerns the management of computer programs, the utilization of software in a nuclear power plant, and the methods the nuclear power industry uses in certifying this software is correct and therefore suitable for real time use in a nuclear power plant. The need is established for improved management skills and attitudes prevalent in the nuclear power industry. It is concluded that quality assurance as it exists today in the nuclear power industry is inadequate. It is further concluded that the basis exists to certify software, and that therefore a certification process, although currently non-existent, can and will exist in the near term future. (LEW)

29847 **(NUREG—0781) Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499) .** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Apr 1986. 744p. NTIS, PC A99/MF A01 - GPO. File Number TI86901301.

The Safety Evaluation Report for the application filed by Houston Lighting and Power Company, City Public Service Board of San Antonio, Central Power and Light Company, and the City of Austin, as applicants and owners, for licenses to operate the South Texas Project Units 1 and 2 (Docket Nos. 50-498 and 50-499) has been prepared by the Office of Nuclear Reactor Regulation of the US Nuclear Regulatory Commission. The facility is located in Matagorda County, Texas, west of the Colorado River, 8 miles north-northwest of the town of Matagorda and about 89 miles southwest of Houston. Subject to resolution of the items discussed in this report, the staff concludes that the applicant can operate the facility without endangering the health and safety of the public.

29848 **(NUREG—0985-Rev.2) Nuclear Regulatory Commission Human Factors Program Plan. Revision 2.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Apr 1986. 64p. NTIS, PC A04/MF A01 - GPO. File Number TI86901355.

This document is the Second Annual Revision to the NRC Human Factors Program Plan. The first edition was published in August 1983. Revision 1 was published in July of 1984. Purpose of the NRC Human Factors Program is to ensure that proper consideration is given to human factors in the design and operation of nuclear power plants. This document describes the plans of the Office of Nuclear Reactor Regulation to address high priority human factors concerns of importance to reactor safety in FY 1986 and FY 1987. Revision 2 of the plan incorporates recent Commission decisions and policies bearing on the human factors aspects of reactor safety regulation. With a few exceptions, the principal changes from prior editions reflect a shift from developing new require-

ments to staff evaluation of industry progress in resolving human factors issues. The plan addresses seven major program elements: (1) Training, (2) Licensing Examinations, (3) Procedures, (4) Man-Machine Interface, (5) Staffing and Qualifications, (6) Management and Organization, and (7) Human Performance.

29849 **(NUREG—1192) Investigation of the contributors to wrong unit or wrong train events.** Persinko, D.; Ramey-Smith, A. (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Apr 1986. 38p. NTIS, PC A03/MF A01 - GPO. File Number TI86901343.

This report presents information on human error in nuclear power plants causing actions to be performed on the wrong train of systems with redundant trains or on the wrong unit of a multi-unit facility. 10 refs.

29850 **(NUREG/CR—3137) Seismic and dynamic qualification of safety related electrical and mechanical equipment.** Subudhi, M.; Curreri, J.; Reich, M. (Brookhaven National Lab., Upton, NY (USA)). Mar 1986. Contract AC02-76CH00016. 62p. (BNL-NUREG—51643). NTIS, PC A04/MF A01 - GPO. File Number TI86008600.

This report presents a summary of methods and procedures that may be used for seismic qualifications of nuclear power plant mechanical and electrical equipment. Incorporated into the text are sections that explain and clarify commonly used qualification terminology and that delineate methods used for dynamic environment simulations used for qualification. The report also presents a scenario of what occurs at a typical Seismic Qualification Review Team (SQRT) audit of a NTOL Nuclear Power Station. One of the main purposes of this report is to assure that industry members involved with seismic qualifications be fully cognizant of all appropriate information required during an audit.

29851 **(NUREG/CR—3365) Report to the NRC on guidance for preparing scenarios for emergency preparedness exercises at nuclear generating stations. Draft report for comment.** Martin, G.F.; Hickey, E.E.; Moelle, M.P.; Schultz, D.H.; Bethke, G.W. (Pacific Northwest Labs., Richland, WA (USA); COMEX Corp., Olympia, WA (USA)). Mar 1986. Contract AC06-76RL01830. 125p. (PNL—4758). NTIS, PC A06/MF A01 - GPO. File Number TI86009373.

A scenario guidance handbook was prepared to assist emergency planners in developing scenarios for emergency preparedness exercises at nuclear power plants. The handbook provides guidance for the development of the objectives of an exercise, the descriptions of scenario events and responses, and the instructions to the participants. Information concerning implementation of the scenario, critiques and findings, and generation and format of scenario data are also included. Finally, examples of manual calculational techniques for producing radiological data are included as an appendix.

29852 **(NUREG/CR—3517) Recommendations to the NRC on human engineering guidelines for nuclear power plant maintainability.** Badalamente, R.V.; Fecht, B.A.; Blahnik, D.E.; Eklund, J.D.; Hartley, C.S. (Pacific Northwest Labs., Richland, WA (USA)). Mar 1986. Contract AC06-76RL01830. 152p. (PNL—4865). NTIS, PC A08/MF A01 - GPO. File Number TI86009596.

This document contains human engineering guidelines which can enhance the maintainability of nuclear power plants. The guidelines have been derived from general human engineering design principles, criteria, and data. The guidelines may be applied to existing plants as well as to plants under construction. They apply to nuclear power plant systems, equipment and facilities, as well as to maintenance tools and equipment. The guidelines are grouped into seven categories: accessibility and workspace, physical environment, loads and forces, maintenance facilities, maintenance tools and equipment, operating equipment design, and information needs. Each chapter of the document details specific maintainability problems encountered at nuclear power plants, the safety impact of these problems, and the specific maintainability design guidelines whose application can serve to avoid these problems in new or existing plants.

29853 **(NUREG/CR—4016-Vol.1) Application of SLIM-MAUD: a test of an interactive computer-based method for organizing expert assessment of human performance and reliability. Volume 1. Main report.** Rosa, E.A.; Humphreys, P.C.; Spettell, C.M.; Embrey, D.E. (London School of Economics and Political Science (UK). Dept. of Social Psychology; Human Reliability Associates Ltd., Parbold, Lancashire (UK); Brookhaven National Lab., Upton, NY (USA)). Sep 1985. Contract AC02-76CH00016. 51p. (BNL-NUREG—51828-Vol.1). NTIS, PC A04/MF A01 - GPO. File Number TI86003784.

The US Nuclear Regulatory Commission has been conducting a multiyear research program to investigate different methods for using expert judgments to estimate human error probabilities in nuclear power plants. One of the methods investigated, derived from multi-attribute utility theory, is the Success Likelihood Index Methodology implemented through Multi-Attribute Utility Decomposition (SLIM-MAUD). This report describes a systematic test application of the SLIM-MAUD methodology. The test application is evaluated on the basis of three criteria: practicality, acceptability, and usefulness. Volume I of this report presents an overview of SLIM-MAUD, describes the procedures followed in the test application, and provides a summary of the results obtained. 14 refs.

29854 **(NUREG/CR—4047) Assessment of the safety implications of control at the Oconee 1 nuclear plant. Final report.** Stone, R.S.; Clark, F.H.; McBride, A.F.; Clapp, N.E. Jr.; Smith, O.L.; Battle, R.E. (Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 314p. (ORNL/TM—9444). NTIS, PC A14/MF A01 - GPO. File Number TI86008422.

As part of the US Nuclear Regulatory Commission's Unresolved Safety Issue on Safety Implications of Control Systems (USI A-47) Program, the Oak Ridge National Laboratory has completed an investigation of nonsafety-grade control system failures at Oconee 1 that could lead to rapid steam generator overfill, reactor overcooling, or reactor overheating (inadequate core cooling). Transients that result from loss of control system power and that threaten plant safety have also been investigated. Detailed examinations of all Oconee 1 major plant systems were performed, followed by a logical evaluation of their influence in the transients of interest. Broad failure mode and effects analyses (FMEAs) were then conducted on each of the candidate plant systems to determine their safety consequences. In these analyses, the effects of common-cause failures upon the Oconee-1 control systems were examined. Sequence analyses using the results of the FMEAs were then performed to assess combinations of failures and the estimated frequencies of these accident sequences. Where simple cause-and-effect relationships could not be demonstrated (i.e., in cases where feedback was found to exist between the failure outcome and the initiating event), a hybrid computer model was used to augment the FMEAs. This model, which was developed with techniques similar to those currently used in other major systems class codes, combines thermal hydraulics, neutronics, and control system packages to produce a total-plant simulator with emphasis on control system dynamics. 28 refs., 29 figs., 30 tabs.

29855 **(NUREG/CR—4332) Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501.** Osborne, M.F.; Collins, J.L.; Haas, P.A.; Lorenz, R.A.; Travis, J.R.; Webster, C.S. (Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 39p. (ORNL/TM—9720). NTIS, PC A03/MF A01 - GPO. File Number TI86008542.

An existing horizontal furnace and a fission product collection system, used for testing light-water reactor fuel under simulated accident conditions, were rebuilt for operation in the vertical orientation. Major changes in the design of the furnace and in the loading/unloading procedure were required. Modifications to the fission product collection components and the steel containment box for the entire apparatus, however, were relatively minor. Because the fuel specimens, the furnace construction, and the general mode of test operation for this new facility are all similar to those of the previously operated facility, no significant changes in the safety hazards are apparent. Adherence to all quality assurance,

personnel training, and operational safety requirements is documented. 16 refs., 10 figs.

29856 **(NUREG/CR—4338) Tellurium behavior in containment under light water reactor accident conditions.** Beahm, E.C. (Oak Ridge National Lab., TN (USA)). Feb 1986. Contract AC05-84OR21400. 25p. (ORNL/TM—9726). NTIS, PC A02/MF A01 - GPO. File Number TI86007761.

Interactions of tellurium in containment can result in changes of physical form and therefore in its transport properties. This report discusses the most probable forms of tellurium in a containment environment under LWR accident conditions. The physical and chemical form of inorganic tellurium species will be determined by condensation, oxidation, and dissolution in water. Of the three volatile tellurium chemical forms, Te_2 (gas), H_2Te, and organic tellurides, only organic tellurides have the potential to remain in the gas phase in a containment atmosphere. There is a general lack of information on the formation and removal of organic tellurides under LWR accident conditions. 41 refs.

29857 **(NUREG/CR—4412) Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance.** Williford, R.E. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 71p. (PNL—5601). NTIS, PC A04/MF A01 - GPO. File Number TI86010225.

Current Emergency Core Cooling System (ECCS) Acceptance Criteria for light-water reactors include certain requirements pertaining to calculations of core performance during a Loss of Coolant Accident (LOCA). The Baker-Just correlation must be used to calculate Zircaloy-steam oxidation, calculated peak cladding temperatures (PCT) must not exceed 1204°C, and calculated oxidation must not exceed 17% equivalent cladding reacted (17% ECR). The minimum margin of safety was estimated for each of these criteria, based on research performed in the last decade. Margins were defined as the amounts of conservatism over and above the expected extreme values computed from the data base at specified confidence levels. The currently required Baker-Just oxidation correlation provides margins only over the 1100°C to 1500°C temperature range at the 95% confidence level. The PCT margins for thermal shock and handling failures are adequate at oxidation temperatures above 1204°C for 210 and 160 seconds, respectively, at the 95% confidence level. ECR thermal shock and handling margins at the 50% and 95% confidence levels, respectively, range between 2% and 7% ECR for the Baker-Just correlation, but vanish at temperatures between 1100°C and 1160°C for the best-estimate Cathcart-Pawel correlation. Use of the Cathcart-Pawel correlation for LOCA calculations can be justified at the 85% to 88% confidence level if cooling rate effects can be neglected. 75 refs., 21 figs.

29858 **(NUREG/CR—4449) PWR hybrid computer model for assessing the safety implications of control systems.** Smith, O.L.; Renier, J.P.; Difilippo, F.C.; Clapp, N.E.; Sozer, A.; Booth, R.S.; Craddick, W.G.; Morris, D.G. (Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 206p. (ORNL/TM—9868). NTIS, PC A10/MF A01 - GPO. File Number TI86008928.

The ORNL study of safety-related aspects of nuclear power plant control systems consists of two interrelated tasks: (1) failure mode and effects analysis (FMEA) that identified single and multiple component failures that might lead to significant plant upsets and (2) computer models that used these failures as initial conditions and traced the dynamic impact on the control system and remainder of the plant. This report describes the simulation of Oconee Unit 1, the first plant analyzed. A first-principles, best-estimate model was developed and implemented on a hybrid computer consisting of AD-4 analog and PDP-10 digital machines. Controls were placed primarily on the analog to use its interactive capability to simulate operator action. 48 refs., 138 figs., 15 tabs.

29859 **(NUREG/CR—4489) Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research.** Whitman, G.D. (Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 172p. (ORNL—6259). NTIS, PC A08/MF A01 - GPO. File Number TI86008412.

The accomplishments of the Heavy-Section Steel Technology Program and other programs having a close relationship to the development of information used in the assessment of light-water reactor pressure vessel integrity are reviewed. The early Pressure Vessel Research Committee planning, the principals contributing to program formulation, the role of the US Atomic Energy Commission, and the developments under the US Nuclear Regulatory Commission sponsorship are identified. The need for major research and development accomplishments in fracture mechanics, heavy-section steel procurement, materials properties, irradiation effects, fatigue crack growth, and structural testing are summarized. The impact of program results on regulatory issues and the development of data used in the preparation of codes, standards, and guides are discussed. Continuing activities and recommendations for future research and development in support of pressure vessel integrity assessments are presented.

29860 **(NUREG/CR—4505) Scoping study of the potential effectiveness of an operational safety reliability program in addressing generic safety problems.** Mueller, C.J.; Bezella, W.A.; Heineman, J.B.; Ragland, W.A.; Rothman, A.B. (Argonne National Lab., IL (USA)). Jan 1986. Contract W-31-109-ENG-38. 132p. (ANL—86-4). NTIS, PC A07/MF A01 - GPO. File Number TI86009372.

This report discusses the potential effectiveness of an Operational Safety Reliability Program (RP) in addressing generic safety problems. The Program was broken down into 8 major elements: in-plant data monitoring, industrywide data monitoring, processing of performance data, determination of performance goals/alerts, analysis of performance data, management functions, prioritization of critical items, and corrective actions. Generic safety problems investigated consisted of the TMI-related action lists, generic safety issues, and human factors issues from R. Emrit et al., "A Prioritization of Generic Safety Issues," NuREG-0933, Rev. 1 (1984); the severe accident precursors occurring in 1980-81; and all published post-TMI abnormal occurrences through June 1984. The study concludes that the Reliability Program, as outlined, has strong potential for effectively dealing with the above safety issues, especially the new generic issues. It also was shown to have potential for either preventing or facilitating problem closures to the great majority of the aforementioned abnormal occurrences and severe accident precursors. Thus, the Program outlined provides a baseline framework upon which an effective licensee Operational Safety Reliability Program can be further developed and implemented.

29861 **(SAND—85-1616C) Hydrogen:air:steam flammability limits and combustion characteristics at intermediate scale.** Marshall, B.W. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 19p. (CONF-8604144—4). NTIS, PC A02/MF A01 - GPO; GPO Dep. File Number TI86009861.

From Spring meeting of the Western States Section of the Combustion Institute; Alberta, Canada (28 Apr 1986).

This paper discusses a series of hydrogen:air:steam combustion experiments which were conducted at Sandia National Laboratories. The purpose of these experiments was to map the entire three-component region of flammability and to study the combustion and heat transfer characteristics of these atmospheres inside a 5.6-m^3 vessel. 9 figs., 15 refs.

29862 **(SAND—86-0027C) Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150.** Benjamin, A.S.; Kunsman, D.M.; Harper, F.T. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 4p. (CONF-860610—6). NTIS, PC A02/MF A01 - GPO. File Number TI86005441.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

Information is presented concerning the evaluation of reactor risk assessment and reactor safety.

29863 (SAND—86-0255C) Research program: the investigation of heat transfer and fluid flow at low pressure. El-Genk, M.S.; Philbin, J.S.; Foushee, F.C. (New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering; Sandia National Labs., Albuquerque, NM (USA); GA Technologies, Inc., San Diego, CA (USA)). 1986. Contract AC04-76DP00789. 20p. (CONF-8604117—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009379.

From 10. U.S. TRIGA user's conference; College Station, TX, USA (7 Apr 1986).

This paper gives an overview of a multiyear joint research program being conducted at the University of New Mexico (UNM) with support from Sandia National Laboratories and GA Technologies. This research focuses on heat removal and fluid dynamics in flow regimes characterized by low pressure and low Reynolds number. The program was motivated by a desire to characterize and analyze cooling in a broad class of TRIGA-type reactors under: (a) typical operating conditions, (b) anticipated, new operating regimes, and (c) postulated accident conditions. It has also provided experimental verification of analytical tools used in design analysis. The paper includes descriptions of the UNM thermal-hydraulics test facility and the experimental test sections. During the first two years experiments were conducted using single, electrically heated rod in water and air annuli. This configuration provides an observable and serviceable simulation of a fuel rod and its coolant channel.

29864 (SAND—86-0277C) Air coolability of TRIGA reactors following a loss-of-coolant accident. El-Genk, M.S.; Kim, S.H.; Zaki, G.M.; Foushee, F.; Philbin, J.S.; Schulze, J. (New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering; GA Technologies, Inc., San Diego, CA (USA); Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 17p. (CONF-8604117—4). NTIS, PC A02. File Number DE86009378.

From 10. U.S. TRIGA user's conference; College Station, TX, USA (7 Apr 1986).

This paper describes the experiments on the air-coolability of a heated rod in a vertical open annulus at near atmospheric pressure. This data can be applied to the coolability of reactor fuel rods that are totally uncovered in a Loss-of-Coolant Accident (LOCA). As a prelude to measuring air coolability of specific core geometries (bundles), heat transfer data was collected for natural convection of atmospheric air in open vertical annuli with an isoflux inner wall and an insulated outer wall (diameter ratios, ϵ, of 1.155, 1.33, 1.63, and 12). Although the inner heated tube had the same overall dimensions as the fuel rod in the Annular Core Research Reactor (ACRR) at Sandia National Laboratories (3.81 cm o.d. and 55.5 cm long), the heated length was only 36.0 cm rather than the entire 50.5 cm for the ACRR's rods. The test assembly was operated at heat fluxes up to 1.38 W/cm^2 with a corresponding surface temperature of 852°K. The annulus data was extrapolated to an equilibrium surface temperature of 1200°K (as a coolability limit of TRIGA reactors) to provide a qualitative estimate of the coolability of multirod bundles by free convection of atmospheric air. The results suggest that for a typical pitch-to-diameter ratio of 1.12 in the ACRR the decay heat removal level is about 1.0 kW/m. This corresponds to an initial decay power following sustained operations at about 12.5 kW/m in the ACRR. However, because of the uncertainties in duplicating the actual thermal-hydraulic conditions in a multirod bundle using a single rod annulus, the actual coolability of open pool reactors could be different from those suggested in this paper. 13 refs., 6 figs.

29865 (SRD-R—276) Literature review of fire modelling techniques and related subjects. Simpson, I.C.; Taylor, N.A. (UKAEA Safety and Reliability Directorate, Culcheth). Sep 1984. 108p. UKAEA, Wigshaw Lane, Culcheth, Warrington WA3 4NE England. File Number TI86901204.

A major review of the fire engineering literature has been carried out, in order to identify pertinent information on fire modelling and related subjects. Fire officers and plant operators of radiochemical plant, especially Sellafield and Dounreay were also canvassed for their ideas and opinions on the fire hazards associated with radiochemical plants, and the areas where fire modelling could be most usefully applied. This report, therefore, reviews and summarizes the information that we have collected and draws conclusions about the desirability and effectiveness of fire modelling, with particular reference to radiochemical plant.

29866 (TPR-NS—27-No.2) Nuclear Safety: technical progress review, April-June 1986. Volume 27, No. 2 . Silver, E.G. (ed.). (Oak Ridge National Lab., TN (USA)). 1986. 154p. GPO $6.00. File Number TI86006671.

Separate abstracts were prepared for 6 papers in this report. (JDB)

29867 (TVA/PE/EDT—85/24) RISKMAN3: an interactive computer code to assist in the review and quantification of system analyses. Simpson, D.B.; Kaplan, S.; Stetkar, J.W. (Pickard, Lowe, and Garrick, Inc., Washington, DC (USA)). Oct 1985. 39p. NTIS, PC A03/MF A01. File Number DE86901267.

This project was initiated to develop a software package for system analysis of the Browns Ferry Nuclear Plant Unit 1 - High Pressure Coolant Injection System. This demonstration utilized a desktop computer that interacted with the existing PRA (probabilistic risk assessment) analysis of this system. The demonstration developed a computer code to reduce the effort required by the system analyst in reviewing system successes or failure frequencies. The results from this demonstration will aid management's decisions concerning changes in design or operating procedures by providing timely information on the effects of such changes upon system reliability.

29868 Reactor safety research: visible demonstrations and credible computations. Loewenstein, W.B.; Divakaruni, S.M. (Electric Power Research Institute, Palo Alto, CA). *Nuclear Safety;* 27: No. 2, 155-177(Apr-Jun 1986).

Communicating nuclear safety research results to the public in a manner that the nonspecialist can understand would help improve public acceptance of and support for the nuclear industry. The clear, positive communication of the airline industry, which enjoys excellent relations with the public, could serve as a model. For a number of years, the Electric Power Research Institute (EPRI) has visibly demonstrated the frequently large safety margins quantified in its research by sponsoring or participating in large-scale test demonstrations. This article discusses EPRI-supported research and results in the areas of source term, seismic and structural engineering research, analysis using probabilistic risk assessment, quantification of safety margins, digital technology development and implementation, and plant transient and performance evaluations. It reveals EPRI's efforts to structure research so that the public can understand the results. 90 refs., 10 figs.

29869 Influence of LOFT PWR transient simulations on thermal-hydraulic aspects of commercial PWR safety. Adams, J.P.; Batt, D.L.; Berta, V.T. (EG and G Idaho, Inc. Idaho Falls). *Nuclear Safety;* 27: No. 2, 179-192(Apr-Jun 1986).

Experimental research programs involving the Loss-of-Fluid Test (LOFT) pressurized-water reactor (PWR) have produced information on PWR accident and operational transient phenomena that has been essential to the development of systems analysis computer codes. This article reviews the LOFT PWR experiments, the most significant research results that have influenced transient phenomena quantification, and the development and assessment of transient calculational techniques. An area for future research is presented that may provide a stronger base for PWR transient calculations through the use of LOFT transients as reference data sets. 49 refs.

29870 Review of the OECD specialist meeting on continuous monitoring techniques for assuring coolant circuit integrity. Thie, J.A. *Nuclear Safety;* 27: No. 2, 193-199(Apr-Jun 1986).

This article summarizes the OECD Specialist Meeting on Continuous Monitoring Techniques for Assuring Coolant Circuit Integrity held August 12-14, 1985, in London. The conference was organized by the Organization for Economic Cooperation and

Development's (OECD's) Committee on the Safety for Nuclear Installations and hosted by Her Majesty's Nuclear Installation Inspectorate at King's College. Many other conferences have addressed analysis and inspection approaches to ensuring primary-system integrity, but the OECD meeting was structured to pay attention to the continuous monitoring approach - possibly the first conference to be so designed. The specific technologies represented were vibrations, noise (i.e., random fluctuations in signals), leaks, acoustic emission, and cyclic fatigue. Although water reactors dominate the papers, all reactor types were included. A diverse group of about 50 attendees from 11 countries participated, including representatives from utilities, suppliers, regulators, and researchers.

29671 **Advanced German Operator Support Systems.** Buttener, W.E.; Fischer, H.D. (Fachhochschule Regensburg, Germany; Kraftwerk Union Aktiengesellshaft, Erlangen, Germany). *Nuclear Safety;* **27**: No. 2, 199-210(Apr-Jun 1986).

This article describes the development of important computerized operator support systems in the Federal Republic of Germany with an emphasis on their safety aspects. Because of the substantial enhancement in automation to handle nuclear incidents and accidents, the number of instrumentation and control systems has increased. The increase necessitates improved information processing and presentation to make automatic actions transparent to the operator. This article describes in some detail the most important German development in this field: the computerized graphics process information system PRINS. This advanced operator support will have a strong influence on new control-room design and will fit into future control rooms with video display units. 15 refs.

29672 **Safety implications associated with in-plant pressurized gas storage and distribution systems.** Guymon, R.H. (Oak Ridge National Lab., TN). *Nuclear Safety;* **27**: No. 2, 228-233(Apr-Jun 1986).

Storage and handling of compressed gases at nuclear power plants were studied to identify any potential safety hazards. Gases investigated were air, acetylene, carbon dioxide, chlorine, Halon, hydrogen, nitrogen, oxygen, propane, and sulfur hexafluoride. Physical properties of gases were reviewed, as were applicable industrial codes and standards. Incidents involving pressurized gases in general industry and in the nuclear industry were studied. In this report general hazards, such as missiles from ruptures, rocketing of cylinders, fires, explosions, asphyxiation, and toxicity, are discussed. Even though some serious injuries and deaths have occurred over the years in industries handling and using pressurized gases, the industrial codes, standards, practices, and procedures are very comprehensive. The most important step one can take to ensure the safe handling of gases is to enforce these well-known and established methods.

29673 **Summary of NUREG-1154: loss of main and auxiliary feedwater event at the Davis-Besse Plant on June 9, 1985.** Murphy, G.A. *Nuclear Safety;* **27**: No. 2, 233-239(Apr-Jun 1986).

On June 9, 1985, Toledo Edison Company's Davis-Besse Nuclear Power Staion, located in Ottawa County, Ohio, experienced a loss-of-all-feedwater event while the plant was operating at 90% power. The event - which involved extensive operator actions inside and outside the control room - included a number of equipment malfunctions and operator errors. This article is condensed from Nuclear Regulatory Commission (NRC) Report NUREG-1154 (Loss of Main and Auxiliary Feedwater Event at the Davis-Besse Plant on June 9, 1985, July 1985), which documents the findings of an NRC team sent to Davis-Besse by the NRC Executive Director for Operations in conformance with the staff-proposed Incident Investigation Program.

29674 **Price-Anderson Act Amendments Act of 1985. Hearing before the Subcommittee on Energy Research and Development of the Committee on Energy and Natural Resources, United States Senate, Ninety-Ninth Congress, First Session on S. 1225, June 25, 1985.** Washington, DC; Government Printing Office (1986). 654p.

A hearing on S. 1225, which clarifies and expands insurance coverage under the Price-Anderson Act, brought testimony from Nuclear Regulatory Commissioners, representatives of several states and power companies, insurance underwriters, and DOE. At issue was DOE's recommended changes to limit liability and to include commercial and defense waste facilities under the provisions for special coverage in event of an extraordinary nuclear occurrence. DOE's request was to update, but not to radically change the Price-Anderson Act. Utilities and insurance underwriters objected to policies which would impose heavier financial burdens on the nuclear power industry by requiring insurance pools. Witnesses noted the adverse effects of unlimited liability as well as the need to insure the health of the insurance industry in conjunction with promoting nuclear power. The testimony of 17 witnesses and additional responses for the record follows the text of S. 1225.

29675 **Fission gas detection system.** Colburn, R. P. (to The United States of America as represented by the United States Department of Energy). US Patent 4,537,740. 27 Aug 1985. Filed date 31 Mar 1983. vp.

PAT-APPL-480961.

A device for collecting fission gas released by a failed fuel rod which device uses a filter to pass coolant but which filter blocks fission gas bubbles which cannot pass through the filter due to the surface tension of the bubble.

29676 **Comparison of three methods for calculating lower confidence limits on system reliability using binomial component data.** Martz, H.F.; Duran, B.S. (Los Alamos National Lab., NM; Texas Tech Univ., Lubbock). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Reliability;* **R-34**: 113-120(Jun 1985).

The Maximum, bootstrap and Bayes methods for calculating lower s-confidence limits on reliability by means of binomial component analysis are presently compared, using Monte Carlo simulations for 20 examples ranging in complexity from simple to moderate. The Maximus method is generally superior for moderate to large series systems of reliable components with small quantities of test data/component, and for small series systems of repeated components. The bootstrap method is generally superior for highly reliable and redundant systems, while the Bayes method is generally superior for moderate to large series systems of reliable components with moderate to large numbers of component tests, and small series systems of reliable nonrepeated components. 29 references.

25 ENERGY STORAGE

2506 Thermal

29677 **(STEV-FVE—85-4) Accumulators for the system of power plants delivering heat and electricity.** Oestergren, A.; Gransell, H. (Statens Energiverk, Stockholm (Sweden)). Nov 1985. 25p. (In Swedish). (STUDSVIK-EI—85-122). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751689.

The results of the calculation of the effect of energy storage on the power production are reported. The calculation has been performed by means of mathematical models and the computer program LOPOP. The efficiency of the accumulators is discussed. The production of back pressure power can thus be considered increased.

29678 **Store heat underground.** Molz, F.J.; Raymond, J.R. (Auburn Univ., AL). *CHEMTECH;* 752-755(Dec 1984).

Underground rock formations that store and transmit water are called aquifers. Aquifers can be composed of many materials, such as limestone, fractured granite, sandstone, or, quite commonly, loose sand. If hot or chilled water is pumped into an aquifer, stored for a period of time, and then recovered, one has produced an aquifer thermal energy storage (ATES) system. The major purpose of such a system is to store energy and thereby correct a mismatch between the availability and the demand for heat or chill. Often this mismatch occurs on a seasonal basis. The three main components of an ATES system are the heat source, the storage aquifer, and the heat sink. Subsystems include the supply and injection wells,

pumps, heat exchangers, and piping. An ATES system for heat storage in an aquifer that is confined above and below by relatively impermeable materials, such as clay or shale, is described. Water within such an aquifer mainly moves horizontally. Because the natural groundwater velocity in confined aquifers is often small, any water pumped into the aquifer remains in a volume essentially concentric with the injection well. At an appropriate time, water can then be pumped back to the surface for use.

2509 Batteries

REFER ALSO TO CITATION(S) 29506, 29507, 29508, 29509, 29510, 29670, 29671, 29672, 29673, 29943, 30050, 30051, 30052, 30053, 30054, 30055, 30056, 30057, 30058, 30059, 30061, 30066, 30067

29879 (CONF-8509154—Summs., pp 5-11) **Overview of Australian lead/acid battery test programs.** Rand, D.A.J. (CSIRO Institute of Energy and Earth Resources, Port Melbourne, Australia). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

In Australia, the main effort in battery testing has been directed towards studies of the lead/acid system, although it should be noted that developmental programs have also been conducted on lithium-based cells, and on manganese-dioxide/zinc, nickel/zinc, zinc/bromine and redox-couple cells. The testing of lead/acid batteries for electric road- and track-vehicles and for remote-area power supply systems is discussed.

29880 (CONF-8509154—Summs., pp 13-15) **Advanced secondary battery development and testing: a Canadian perspective.** Benninger, G.N. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Advanced secondary battery development in Canada is principally centered around both lithium and sodium systems. Lithium systems development activities have been conducted by numerous investigators. Ballard Research, Moli Energy, and Electrofuel Mfg. Co. are among those who have made significant contributions in this area. The recent joint venture between Swiss controlled Brown, Boveri & Cie of Manheim, West Germany, and Magna International Inc. of Markham, Ontario has resulted in intense activity in the sodium-sulfur area. Ballard Research, located in the Vancouver area, is well know for its capabilities in the manufacturing technology of non-rechargeable lithium-sulfur dioxide cells. More recently, this work has been extended to include rechargeable cells ranging from .8 Ah to 6.2 Ah capacities. Capacities and life cycle rating parameters for these cell are presented.

29881 (CONF-8509154—Summs., pp 17-18) **Testing of batteries in Germany.** Voss, E. (VARTA Batterie AG, Forschungs- und Entwicklungszentrum, Kelkheim, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Testing of batteries in Germany, in particular of lead-acid batteries for electric road vehicles during the last one or two decades probably did not and still does not differ too much from tests applied and performed on electric vehicle batteries elsewhere in the world. Nevertheless, a report on the history of this testing as it occurred in this country may be of general interest to battery engineers and battery users because some symptomatic events very much effected the course of battery development. With respect to lead-acid batteries, a power source with a history of more than 100 years, three areas of testing are described, i.e., laboratory testing during R + D, laboratory and/or practical testing of developed products for new applications, and laboratory testing of developed batteries for conventional applications and its relevance to practical behavior.

29882 (CONF-8509154—Summs., pp 20) **Overview of battery testing in the UK.** Sudworth, J.L. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The testing of advanced batteries, other than lead-acid, is currently taking place in three or four laboratories in the UK. Testing regimes used for sodium-sulfur batteries and lithium/aluminium - iron sulfide batteries is described. Advanced lead-acid batteries for vehicles, load levelling and solar storage are tested according to procedures laid down by SAE and IEEE by commercial battery manufacturers.

29883 (CONF-8509154—Summs., pp 22-26) **Overview of rechargeable battery testing in Japan.** Takahashi, S.; Hiramatsu, T. (Government Industrial Research Institute, Osaka, Japan). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

In Japan, advanced batteries, Na-S, Zn-Cl_2, Zn-Br_2, and Cr-Fe redox-flow battery, aiming for utility load-leveling applications have been actively developed in the Advanced Battery Electric Power Storage System Project. This project was started in FY 1980 and scheduled to be continued to FY 1990, and a 1000 kW demonstration plant is planned to be constructed and tested. Regarding the batteries for vehicular applications, relatively small-scale projects have been carried out by the Japan Electric Vehicle Association (JEVA) and the Japan Electric Vehicle Engineering Research Association (JEVERA) after the Electric Vehicle Project (FY 1971 ~ 1976). The outline of these projects and battery testing practices in them are reported.

29884 (CONF-8509154—Summs., pp 28-32) **Overview of rechargeable battery testing in the United States.** Butler, P.C. (Sandia National Labs., Albuquerque, NM). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Battery testing activities are a significant part of many battery development and engineering programs in the United States. Improved and advanced cells and batteries are being evaluated for electric vehicle, load-leveling, solar, aerospace, and military applications. These programs are being carried out by industrial, national, military, and other independent laboratories. Many testing laboratories are funded by the US Department of Energy (DOE) for the evaluation of systems being developed by independent and government-funded programs. Battery testing facilities, types of electrochemical systems on test, and testing methods for both DOE-funded and some independently-funded programs as described.

29885 (CONF-8509154—Summs., pp 38-42) **Test programs at the National Battery Test Laboratory.** Hornstra, F. (Argonne National Lab., IL). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The National Battery Test Laboratory (NBTL) was established at Argonne National Laboratory (ANL) in 1976 as a facility for studying advanced electric storage batteries. The facility tests batteries developed under Department of Energy (DOE) programs and for private sponsors. The batteries tested are for utility load leveling, propulsion of electric and hybrid vehicles (EHVs), solar energy storage, and other related applications. The NBTL serves five key roles in battery development programs: it serves as a facility for testing cells and batteries at various stages of development, it provides a centralized and independent facility for comparing and evaluating the performance of various types and brands of batteries under uniform operating conditions, it permits the testing of battery performance under simulated operating conditions before field demonstration, it provides data for battery analyses and improvement, and it serves as a facility for battery charge, discharge, and thermal studies.

29886 (CONF-8509154—Summs., pp 58-62) **Autonormalization of battery test data to significantly reduce impact of battery aging on test results.** Hornstra, F. (Argonne National Lab., IL). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Batteries show varying rates of capacity decline as they are charged and discharged cycled. As a consequence, data from any test implicitly contain an effect of cycle history, which may be different for each battery at the time that a test is conducted. Batteries, alike in all other respects, may yield different results when subjected to the same test simply because of a difference in history. Similarly, an identical test applied to the same battery at different times in its history may yield different results. A method of normalization employed at the National Battery Test Laboratory, called autonormalization, can be used to adjust, or normalize, test results to the original capacity, the rated capacity, or any point of reference for the battery. The use of this methodology effectively eliminates the effect of aging on the test results. As a consequence, improvements in the reproducibility of test results are achieved, and more meaningful and rational comparisons among and within battery types can be made.

29087 (CONF-8509154—Summs., pp 69-73) **Flowing electrolyte batteries test methods and results.** Butler, P.C.; Robinson, C.E. (Sandia National Labs., Albuquerque, NM). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Prototype zinc/bromine, zinc/ferricyanide, and iron/chromium redox flowing electrolyte cells and batteries have been tested at Sandia National Laboratories since 1980 in order to evaluate development program progress. These units have been subjected to baseline tests to determine stable operating conditions, a factorial test matrix to evaluate the sensitivity of electrochemical efficiency to changes in operating conditions, and life cycle tests. In some cases, stable baseline performance was not obtained, and therefore, the other test modes were not performed. Also, some batteries failed prior to completion of the factorial test matrix. In three cases, however, the entire test regime was implemented and completed; these batteries are still on life cycle test. The test methods used to evaluate these batteries are reviewed. The factorial test matrix and its results are described. Other necessary aspects of prototype testing, such as operation and maintenance issues are discussed.

29088 (CONF-8509154—Summs., pp 75-78) **Circulating electrolyte zinc/bromine battery test program and procedures.** Grimes, P. (Exxon Research and Engineering Co., Linden, NJ). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The Exxon circulating electrolyte zinc/bromine battery system is being co-developed by organizations in America, Europe, Japan, and Australia. The circulating electrolyte zinc-bromine battery systems have reached the multi-kilowatt hour capacity size ranges. Several 20-kWh and 30-kWh systems have been successfully tested in different modes of operation. Circulating electrolyte batteries use a test program procedure which considers the circulation system characteristics, in addition to the classical test procedures. The test program and procedures are described.

29089 (CONF-8509154—Summs., pp 80) **Start-up test for NaS-traction-batteries.** Geilert, U.; Eck, G. (Brown, Boveri & CIE Aktiengesellscaft, Heidelberg, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

NaS-batteries are high temperature batteries with high energy density (ca. 100 Wh/kg, 100 Wh/l). Their inner resistance shows no significant dependency neither from state of charge nor from load. The start-up tests check the capacity, inner resistance, insulation resistance and proper operation of the thermal management system. The test facility and instrumentation for this battery type consist of a computer controlled inverted rectifier and several data logger systems. The data to be measured are temperature in the cell matrix, current in each cell chain, total battery current, voltage of each half chain, air flow of the cooling system and power of the heater plates. The first step of the start-up procedure is heating up of the battery. If the operating temperature can not be reached within a time limit, the heater plates of the vacuum insulation are defect, which has to be proven by appropriate measurements.

29090 (CONF-8509154—Summs., pp 88-92) **Testing methods for lithium-molybdenum disulfide intercalation batteries.** Brandt, K. (Moli Energy Ltd., Burnaby, British Columbia). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Moli Energy Limited has, during the past seven years, developed rechargeable lithium molybdenum disulfide batteries which have a number of superior performance characteristics including a high energy density relative to other rechargeable batteries, a high power density, and a long charge retention time. These characteristics have been demonstrated in AA size (IEC nomenclature: R-6) and C size (R-14) configurations as well as in a developmental BC size (R-40) format. The unique features of a lithium intercalation battery require specialized testing methods. In this study, methods to evaluate cycle life, energy, and power densities are discussed. These methods have been used over the years to evaluate the progress of the development of this battery system. They can be used to test single cells of different sizes as well as batteries.

29091 (CONF-8509154—Summs., pp 94-98) **Quality test of lead accumulators, especially of maintenance-free, sealed lead batteries with immobilized electrolyte.** Eberts, K. (Accumulatorenfabrik, Sonnenschein, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Before performing the task of testing a battery, the question arises whether there are regulations in this respect or general standards to be applied. In Germany, the standard DIN 43,539, Part 1, contains the generalities and common tests of accumulators. The contents of this standard are divided into 7 principal points. The scope confirms that this standard is valid for all kinds of accumulators and has the purpose of stipulating the definitions and general tests of accmulators, the type test, the acceptance test and tests during operation, i.e., 3 different test procedures.

29092 (CONF-8509154—Summs., pp 100-104) **Battery data for use in expert systems.** Hodgson, R.; Oman, H. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Expert systems, readily implemented by battery specialists on personal computers with programs, such as empty shells, can now perform complex comparisons of alternative battery choices. The applications being evaluated might be uninterruptible power supplies, solar energy storage, emergency power, or customer-side-of-the-meter load leveling. Each has unique requirements in voltage limits and delivered energy during discharge, in a range of temperatures. Batteries being compared need not be identical in performance. For example, in cycling service, two sets of $2000 batteries lasting three years each can be cheaper than a $4000 set lasting six years because of interest earned in the the first four years by the unspent $2000. Standardized performance data is a key to validity of these comparisons. A simple example is temperature at which the battery voltage and ampere hours are measured. The steps and effort that would be needed to achieve standard formats for organizing and presenting battery data are identified. The data and procedures vocabulary are illustrated with examples from the Boeing computer-based battery testing, data acquisitions, and data analysis system.

29093 (CONF-8509154—Summs., pp 111) **Rapid testing of beta alumina ceramics.** Sudworth, J.L. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The key component in the Beta Battery is the solid electrolyte; normally beta alumina. Several laboratories have developed beta alumina formulations which have a long life in sodium-sulfur

cells, but research and development is continuing, with the aim of improving the characteristics of the electrolyte and adapting the fabrication process to large scale production. An obstacle to rapid progress in beta alumina development is the time taken to test new formulations - at normal current densities, a life of 1000 cycles could not be achieved in less than a year. Out of cell tests are of limited use for predicting electrolyte life, and most developers test solid electrolytes in sodium-sulfur cells at current densities around 100mA/cm², although the cells are capable of being charged and discharged at much higher rates. Recent work has shown that current densities can be increased further to give over 28 cycles per day (20 minute discharge, 30 minute charge) without shortening the ceramic cycle life.

29894 (CONF-8509154—Summs., pp 116) **Data acquisition and control instrumentation of the BEWAG battery test facility.** Aust, K.D.; Kraemer, K.G. (Berliner Kraft- und Licht (BEWAG) AG, Berlin, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The control and data acquisition system used in the BEWAG battery test facility are described. The structure of the system is outlined as well as the tasks performed.

29895 (CONF-8509154—Summs., pp 118-120) **Battery monitoring and integrity testing of large lead-acid storage batteries.** Alber, G. (Alber Engineering, Inc., Boca Raton, FL). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

In the past most battery users have relied on battery manufacturers and industry standards for recommendations on how to maintain their batteries. Unfortunately, these recommendations have been very slow in recognizing the major cause of battery systems failures. Most battery user's maintenance programs consist of monthly, quarterly and annual inspections calling for: visual inspection of batteries and battery racks and static measurements of overall battery voltage, individual cell voltage, electrolyte temperature and specific gravity. If any load testing is done at all, it is typically a capacity test performed at five-year intervals. A concept of continuous battery monitoring is described. The concept increases the battery system's reliability, extends battery life, and reduces maintenance man-hours.

29896 (CONF-8509154—Summs., pp 122-124) **Use of computer network to achieve testing flexibility.** Altmejd, M. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Powerplex Technologies has recently established sodium-sulfur battery and module test capability. The test system is based on a network of computerized battery test stations. These test stations, described in detail are capable of cycling and characterizing batteries consisting of 187 volt strings or battery submodules made up of 2 to 50 volt strings. The system was designed to minimize the need for operator training. Operator commands are entered by means of touch screen terminals. The networked stations allow the flexibility required by both development and manufacturing. Additional test stations can easily be added as required while maintaining central storage of all test results. The test information handled by this system include amp-hour capacities, cell impedance, voltage and temperature characteristics.

29897 (CONF-8509154—Summs., pp 126-130) **Multiple constant power discharge tester.** Kiessling, R. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The range of battery applications is increasing year by year. Nevertheless, new concepts of batteries are being developed and have entered the market. It is the lead-acid battery which is taken into consideration first for any new application for secondary batteries. Therefore, this study was orientated primarily to the problems of this system. It seems to be evident that new applications are more sophisticated than the already established ones and call for more sophisticated battery designs and test procedures. The frequency control facilities under construction at the Berlin electric power utilities (BEWAG) where modern design lead-acid batteries will act as energy buffers are described. The batteries will supply additional power into the mains whenever the demand is increasing and will be recharged at decreasing demands. As this operation will only last as long as it is necessary to adjust the power plants to the new situation the load will change rapidly within seconds or minutes.

29898 (CONF-8509154—Summs., pp 136-138) **Post-test analyses of Na/S cells and aqueous batteries.** Battles, J.E.; Smaga, J.A.; Marr, J.J. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Post-test examinations are conducted at Argonne National Laboratory to obtain quantitative information on electrode morphology, corrosion and degradation of the cell hardware, and mechanisms responsible for the construction of these cells and support their efforts in achieving improved cell performance, cycle life, and reliability. The results of post-test analyses of recent high-temperature sodium-sulfur cells, and of aqueous lead-acid and nickel/iron batteries are presented. In particular, the relationship between electrode performance and morphology was examined for each of the three battery systems.

29899 (CONF-8509154—Summs., pp 143-146) **In-test and post-test analyses of sodium-sulfur cells.** Wada, M.; Kawamoto, H.; Hatch, H. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Cell life of sodium-sulfur cells is often determined by the degradation of the solid electrolyte. Solid electrolyte degradation will cause an increase of electrolyte resistivity, decrease of faradic efficiency, or even an electrolyte rupture which leads to a cell temperature rise due to direct reaction of reactants. Electrolyte degradation in actual sodium-sulfur cells is believed to be caused by the passage of sodium ion current across the solid electrolyte. The degree of degradation has been reported to be a function of amount of charge passed through the electrolyte, and the breakdown of the solid electrolyte was observed to occur above some threshold. For this reason, the concentration of sodium ion current density is to be avoided to prevent solid electrolyte from premature degradation and rupture, and the electrode structure for a sodium-sulfur cell should be determined with enough care to homogenize the current density distribution on the electrolyte. The longitudinal current density distribution of a sodium-sulfur cell was measured by attaching probing terminals on the electrode container. It was found that the current density distribution of a vertically supported cell was inhomogeneous due to the effect of gravity. This setup can be used as a way to locate the place where the first electrolyte cracking occurs. It was also found that the electrolyte cracking accompanies a fluctuation of cycling cell voltage that starts to appear several cycles before the noticeable break down of the electrolyte.

29900 (CONF-8509154—Summs., pp 170-174) **How handy is Weibull or, the use of failure distributions in the planning and analysis of battery experiments?.** Spindler, B. Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Methods of designing experiments to provide for statistical evaluation are well established. Factorial plans have been used successfully for decades. Methods are more recently available for incorporating analysis of failure distributions, such as the Weibull. When electrical performance data are identified with modes of failure, additional statistical insights can be achieved. The objectives of this review are to show (1) how Weibull results can be obtained completely by hand in a few minutes without lengthy calculations, and (2) an example of augmenting results and understanding of a previously analyzed statistical experiment by use of Weibull analysis of the failure data. The benefits of planning experiments to in-

clude studies of failure modes and distributions will be more accessible if the engineer or technician understands and does most of the analysis himself, rather than being too heavily dependent upon statisticians or computer programs.

29901 (CONF-8509154—Summs., pp 175) **Introduction to Weibull analysis.** Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The statistical analysis of inspection data and test information can provide useful and quantitative information about a product. The analysis is particularly useful in evaluating product reliability, conformity to specifications, or in comparing alternate materials, designs, and fabrication procedures. Weibull analysis is one statistical method of analyzing data. It provides a graphical solution of the statistical problem with a minimum of time and effort. A discussion of the Weibull techniques, a derivation of the reliability equation, and the application of this equation to test results are presented as well as specific examples of situations where the Weibull technique is applicable.

29902 **(LBL—20816) Solid electrolyte for high energy density batteries.** De Jonghe, L.C. (Lawrence Berkeley Lab., CA (USA)). Dec 1985. Contract AC03-76SF00098. 13p. (CONF-860172—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009358.

From Japan Ceramic Society meeting; Sendai, Japan (24 Jan 1986).

High energy density batteries, consisting of sodium/sodium polysulfide electrochemical couples, separated by the ion conducting ceramic electrolyte sodium beta″-alumina, are now at the stage where commercialization is realistic. The detailed study of the various degradation processes occurring in the solid electrolytes, have been shown to be avoidable by microstructural control of the electrolytes, limiting the grain size to below 50 micron everywhere, by controlling the contamination levels of the system during operation, and by proper cell design that avoids current heterogeneity.

29903 **Cell design for lithium alloy/metal sulfide battery.** Kaun, T. D. (to The United States of America as represented by the United States Department of Energy). US Patent 4,540,642. 10 Sep 1985. Filed date 30 Mar 1984. vp.

PAT-APPL-595203.

The disclosed lithium alloy/iron sulfide cell design provides loop-like positive and negative sheet metal current collectors electrically insulated from one another by separator means, the positive collector being located outwardly of the negative collector. The collectors are initially secured within an open-ended cell housing, which allows for collector pretesting for electrical shorts prior to adding any electrode materials and/or electrolyte to the cell. Separate chambers are defined outwardly of the positive collector and inwardly of the negative collector open respectively in opposite directions toward the open ends of the cell housing; and positive and negative electrode materials can be extruded into these respective chambers via the opposite open housing ends. The chambers and cell housing ends can then be sealed closed. A cross wall structurally reinforces the cell housing and also thereby defines two cavities, and paired positive and negative collectors are disposed in each cavity and electrically connected in parallel. The cell design provides for a high specific energy output and improved operating life in that any charge-discharge cycle swelling of the positive electrode material will be inwardly against only the positive collector to minimize shorts caused by the collectors shifting relative to one another.

29904 **Fuel cell having dual electrode anode or cathode.** Findl, E. (to The United States of America as represented by the Department of Energy). US Patent 4,529,670. 16 Jul 1985. Filed date 10 Apr 1984. vp.

PAT-APPL-598611.

A fuel cell that is characterized by including a dual electrode anode that is operable to simultaneously electro-oxidize a gaseous fuel and a liquid fuel. In alternative embodiments, a fuel cell having a single electrode anode is provided with a dual electrode cathode that is operable to simultaneously reduce a gaseous oxidant and a liquid oxidant to electro-oxidize a fuel supplied to the cell.

29 ENERGY PLANNING AND POLICY

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 29261, 29563, 29790, 29942, 30592, 30622, 31085, 31258

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 29195, 29201, 29228, 29331, 29689, 29690, 29692, 29695, 29705, 29706, 29709, 29713, 29733, 29738, 29739, 29741, 30406, 30529, 30532, 30551, 30557, 30565, 30568, 30593, 30600, 30611, 30670, 30736

29905 **(DOE/BP—582) Preliminary radon testing results for the Residential Standards Demonstration Program. Program results No. 3.** Reiland, P.; McKinstry, M.; Thor, P. (USDOE Bonneville Power Administration, Portland, OR. Office of Conservation). Jan 1986. 38p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008826.

This paper reports measurements for heating season radon concentrations in indoor air for 289 homes in the Pacific Northwest. The homes are part of the Bonneville Power Administration (BPA) Residential Standards Demonstration Program, and include 143 dwellings constructed to the Model Conservation Standards proposed by the Northwest Power Planning Council (MCS homes) and 146 control dwellings built over the last several years to current building codes (control homes). These results indicate that the location of the dwelling was a more important determinant of indoor radon concentration than was use or non-use of the MCS. Previous studies have shown that radon levels in dwellings are only weakly correlated with air exchange rates, and that control of radon sources is a more practical and effective method of reducing indoor concentrations.

29906 **(NP—6751698) Federal Environmental Office annual report 1984.** (Umweltbundesamt, Berlin (Germany, F.R.)). 1985. 164p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE86751698.

The Federal Environmental Office has been responsible for the R and D projects of the BMI since 1976. Among others its tasks comprise: Information and documentation in the field of environmental affairs; legal, economic, and social problems related to environmental affairs; promotion of non-hazardous products; environment planning and ecological planning; studies on pollutant effects, especially in connection with chemical substances with adverse effects on the environment; road transportation; energy; air pollution abatement; noise control; waste management; water economy. (orig.).

29907 **Effect of distance on the preservation value of water quality.** Sutherland, R.J.; Walsh, R.G. (Los Alamos National Lab., NM). *Land Economics;* **61**: No. 3, 281-291(Aug 1985).

In the past dozen years, an extensive body of literature has developed on the willingness to pay for water quality, in particular, its recreation use and nonuse preservation values. This paper illustrates a procedure for estimating the effect of distance on the preservation value of environmental quality using the contingent valuation approach. The case considered is the potential degradation of water quality due to coal mining activity in the Flathead River drainage system, Montana. The analysis supports a negative association for this particular study area. The effect of distance on preservation value was considered both directly and indirectly through its effect on visits. 36 references, 2 tables.

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 29461, 29465, 29476, 29477, 29482, 29614, 29621, 29628, 29635, 29981, 29982, 30019

29908 (CONF-8509142—, pp 5-9) **Overview of the US Department of Energy Geothermal program.** Mock, J.E. (Dept. of Energy, Washington, DC). 1985. NTIS, PC A09/MF A01.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Conservation and Renewable Energy programs of DOE have undergone a significant reorganization in that the DOE Hydropower Program has been separated from the Geothermal Program. The Geothermal Program embraces a two-pronged approached to technology development. One thrust is on hydrothermal resources where both near- and long-term research is being conducted to remove technical barriers to hydrothermal exploitation and to increase the economically recoverable resource base. The second thrust of the program is to increase the resource base with long-term R and D which will ultimately lead to the demonstration of the viability of other forms of the geothermal resource, specifically geopressured brines, hot dry rock, and magma. 3 figures.

29909 (CONF-8509142—, pp 15-20) **Geosciences research in DOE - 1985.** Kolstad, G.A. (Dept. of Energy, Washington, DC). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Geosciences Program of the Office of Basic Energy Sciences has as its objective to support and provide basic, long-range research in the earth and near-space sciences in areas relating to the energy and military missions of the DOE. Continental scientific drilling is the largest area of program emphasis. This is an area where the DOE's Geosciences research program has taken the lead in helping to establish a cooperative national continental scientific drilling program by working closely with the USGS and NSF. Recent significant accomplishments of the program are recounted. 8 figures.

29910 (CONF-8509142—, pp 119-126) **Sandia geothermal technology program: interactions with other DOE research and CSDP.** Traeger, R.K. (Sandia National Labs., Albuquerque, NM). 1985. NTIS, PC A09/MF A01. File Number DE86004074. Contract AC04-76DP00789.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

When the energy programs were initiated in the mid 70's, Sandia management made a conscious decision to apply existing Engineering expertise and capabilities in support of industry, government and university needs. A decision was made not to expend resources independently developing a panacea for the US energy ills. Consequently, exchange of the information and technology with other occurred from the start prior to the Tech Transfer buzz works on the 1980s. The purpose of this paper is to briefly outline the Geothermal Technology Development (GTD)-supported Sandia programs. Then, it will be shown how these programs interact with other energy programs at Sandia. Finally, the author will discuss the overall Continental Scientific Drilling Program, its status (except for details on the GTD-run Salton Sea Experiment which is discussed elsewhere), and Sandia GTD interactions with CSDP. 8 tables.

29911 (CONF-8509142—, pp 157-162) **INEL injection research: physical model studies.** Stiger, S.G.; Hull, L.C. (Idaho National Engineering Lab., Idaho Falls). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The primary objective of the INEL Injection Research Program is to develop a better understanding of injected fluid migration in fractured geothermal reservoirs. The INEL program combines laboratory experimentation, computer simulation and field testing in the study of fluid migration. A sound theoretical understanding of the fundamental processes that control mass, heat and solute transport through fractured rocks is necessary to understand how injected fluids will interact with geothermal reservoirs. A transport algorithm for fractures was developed and a simple single fracture code written. The algorithm was verified against analytical solutions and validated against laboratory data. The FRACSL reservoir code currently uses this approach to tracer transport. The flow and transport components of FRACSL have been validated using a two-dimensional laboratory fracture network. A good match between the laboratory data and the FRACSL simulations was obtained using no empirical parameters. The laboratory and simulations studies conducted to date have dealt with discrete fractures in impermeable matrix materials. A laboratory model has been developed to allow studies of dual-permeability fracture systems during FY-86. 9 references, 9 figures.

29912 (CONF-8509142—, pp 103-166) **Brine injection studies.** Lippmann, M.J. (Lawrence Berkeley Lab., CA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The program of the Lawrence Berkeley Laboratory in Brine Injection Technology is comprised of field and theoretical activities. Emphasis is given to the study of migration of injection fluids and compositional effects in the reservoir, and optimizing the heat extraction from geothermal systems. A joint injection test program with industry has also been initiated. The results of the FY1985 effort and the proposed plans for FY1986 are described. 9 references, 3 figures, 1 table.

29913 (CONF-8509142—, pp 167-173) **Heat cycle research experimental program, FY-1985.** Bliem, C.J.; Demuth, O.J.; Mines, G.L.; Whitbeck, J.F. (EG and G Idaho Inc., Idaho Falls). 1985. NTIS, PC A09/MF A01. File Number DE86004074. Contract AC07-76ID01570.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Heat Cycle Research Program, which is being conducted for the Department of Energy, has as its objective the development of the technology for effecting improved utilization of moderate temperature geothermal resources. Testing at the Heat Cycle Research Facility located at the DOE Geothermal Test Facility, East Mesa, California is presently being conducted to meet this objective. Current testing involves supercritical vaporization and counterflow in-tube condensing system. The paper presents a brief description of the test facility and a discussion of the test program. Results of the experiments for the supercritical heaters and the countercurrent, vertical, in-tube condenser are given for both pure and mixed-hydrocarbon working fluids. The heater and condenser behavior predicted by the Heat Transfer Research Institute computer codes used for correlation of the data was in excellent agreement with experimental results. Preliminary results of tests in which the turbine expansion passed through the two-phase region did not indicate efficiency degradation assignable to these metastable expansion processes. 6 references, 9 figures.

29914 (CONF-8509142—, pp 179-182) **Overview geopressure program.** Coffer, H.; Ramsthaler, J. (Idaho National Engineering Lab., Idaho Falls). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Department of Energy has been studying geopressured-geothermal aquifers to evaluate the size of the resource and the possibilities of utilizing the chemical, thermal, and hydraulic energies contained in the brine. The work to date has shown that the potential resource is large (hundreds to thousands of quads of energy) and that it can be produced at sustained rates of over 30,000 barrels per day. Reservoir behavior is not fully understood since the large reservoirs appear to increase in size with increased production. The next phase of the study will be long term tests that should give a better understanding of reservoir behavior. Future tests will also include a joint experiment with EPRI to combine the thermal energy of the hot brine with the chemical energy of the

methane to maximize the amount of electricity which can be produced.

29915 (CONF-8509142—, pp 183-192) **Overview of geopressured-geothermal research.** Dorfman, M.H. (Univ. of Texas, Austin). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

During the past year significant research developments have occurred at the University of Texas through the Center for Energy Studies (CES) and the Bureau of Economic Geology (BEG). Areas of interest include liquid hydrocarbon migration, subsidence studies, well-logging research, geothermal simulation, geothermal information systems, and rock mechanics research. The development of a relational data base for well and reservoir data is described in a separate appendix. The appendix also contains a description of a geopressured-geothermal bibliography. 10 references, 12 figures.

29916 **(ETSU-R—30) Prospects for the exploitation of the renewable energy technologies in the United Kingdom.** (UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.). May 1985. 107p. H.M. Stationery Office, London, price Pound 7.00.

The prospects for the exploitation of the renewable energy technologies in the United Kingdom are reviewed. The technologies considered are bio-fuels, passive solar design, active solar heating, geothermal aquifers, geothermal hot dry rocks, wave energy, wind energy, tidal power, hydro power and photovoltaic energy. The technologies are appraised against economic attractiveness, technically achievable potential, environmental acceptability, potential for rapid deployment in extreme scenarios, export or import opportunities and health and safety. Both electrical and heat and fuel producing renewables are considered. The technologies are finally classified as economically attractive, promising but uncertain or long shot. (UK).

29917 **(ETY—4/83) National energy information system for Finland.** Hakulin, L. (Finnish Energy Economy Association, Helsinki). 1983. 70p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751661.

The report presents the findings of a preliminary study on a national energy information system for Finland. The goals proposed for a national energy information system are national information is easily available for all user categories; international energy development in aras essential for Finland is systematically monitored and evaluated and domestic research results are internationally presented in such a form that Finland's role as energy expert will be strengthened. A model for a national information system is presented, where the main frame, consists of the library network and the branch organizations in the energy field. For strengthening the information network the establishment of a new energy information centre is proposed. The main activities of the centre would be advisory and referral services, monitoring and evaluation of published information, data base management and development and coordination of the national energy information system.

29918 **(STEV-FVE—85-1) Research project District Heating.** Ernstsson, G.; Kirchner, W.; Sandberg, E. (Statens Energiverk, Stockholm (Sweden)). Nov 1984. 128p. (In Swedish). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751675.

In two parts.

This paper gives a survey of finished and running research projects in Sweden on district heating during the fiscal year 1980/1981-1983/1984. 93 projects are presented.

29919 **Information flow from Japan to US researchers in applied and basic energy research fields.** Hutchinson, R.A.; Eisenhauer, J.L.; Hane, G.J.; Debrodt, D.C. (Battelle, Pacific Northwest Lab., Richland, WA). *Journal of Technology Transfer;* **10**: No. 1, 1-7(Fal 1985).

A recent study conducted by Pacific Northwest Laboratory (PNL) evaluated technical information transfer from Japan to the US as part of a larger assessment of international monitoring of energy technology development conducted for DOE. For this study, US researchers in each of ten selected technical fields were identified and interviewed to obtain their perceptions of information transfer from Japan. Results from these interviews indicated that, although there are major differences among the technical fields, US researchers generally consider information transfer from Japan to the US to be inadequate. Researchers particularly noted the difficulties they have attending conferences in Japan or visiting Japanese research facilities. In contrast, Japanese researchers attend all major conferences and frequently visit laboratories in the US including improving the screening and translation of technical material published in Japan, promoting binational seminars and workshops, and encouraging laboratory visits and exchangers of research personnel. 1 table.

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 29329, 29419, 29447, 29448, 29449, 29790, 29874, 30517, 31009

2907 Transport And Storage

REFER ALSO TO CITATION(S) 29988

2910 Conservation

REFER ALSO TO CITATION(S) 30019, 30020

2920 Supply, Demand, And Forecasting

29920 **(DOE/CS/60210—T1) Energy data, 1970-1984.** (Florida Governor's Energy Office, Tallahassee (USA)). Dec 1985. Contract FG44-77CS60210. 115p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86009277.

Florida Energy Data: 1970-1984 presents data on energy consumption, prices, and expenditures by fuel type and sectors. Florida-specific information is provided on oil and natural gas production, use of renewable resources, and electric generation and distribution. Additionally, comparisons of energy consumption by sector and by type are included for the United States and Florida. While data are presented on an annual basis, selected monthly information may be obtained rom the Governor's Energy Office. Florida Energy Data: 1970-1980 updates and revises selected data contained in the following documents: Forecasts of Energy Consumption in Florida: 1980-2000; Florida Energy Resources; and Florida Energy Data, 1970-1983.

29921 **(NP—6751693) Uganda - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Sep 1985. 12p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751693.

The energy situation of Uganda is reviewed on the basis of relevant data. Some remarks on the country's national energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on the balance of payments. (UA)

29922 **(NP—6751694) Egypt - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Sep 1985. 14p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751694.

The energy situation of Egypt is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade, and some aspects of bilateral cooperation on the energy sector are discussed. (UA).

29923 **(NP—6751695) Jamaica - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Oct 1985. 11p. (In German). NTIS (US Sales Only), PC A02. File Number DE86751695.

The energy situation of Jamaica is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29924 **(NP—6751696) Malaysia - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Oct 1985. 17p. (In German). NTIS (US Sales Only), PC A02. File Number DE86751696.

The energy situation of Malaysia is reviewed on the basis of some relevant data. Remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. (VA).

29925 **(NP—6751697) Algeria - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Nov 1985. 21p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751697.

The energy situation of Algeria is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29926 **(NP—6751699) France - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Nov 1985. 30p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751699.

The energy situation of France is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29927 **(NP—6751700) Luxembourg - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Oct 1985. 25p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751700.

The energy situation of Luxembourg is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29928 **(NP—6751701) Togo - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Nov 1985. 20p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751701.

The energy situation of Togo is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Data are presented on external trade and the balance of payments. (UA).

29929 **(NP—6751703) Kuwait - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Dec 1985. 15p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751703.

An outline of Kuwait's energy situation in general is followed by a review of the situation as far as its two only energy sources, petroleum and natural gas, are concerned. Data are presented on the country's external trade, balance of payments, and cooperation with the Federal Republic of Germany on the energy sector. (UA).

29930 **(NP—6751704) Tunisia - energy situation 1984/1985.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Nov 1985. 9p. (In German). NTIS (US Sales Only), PC A02. File Number DE86751704.

The energy situation of Tunisia is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29931 **(NP—6751705) Uruguay - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Dec 1985. 19p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751705.

The energy situation of Uruguay is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29932 **(NP—6751706) Brazil - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Dec 1985. 25p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751706.

The energy situation of Brazil is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29933 **(NP—6751707) Ethiopia - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Nov 1985. 13p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751707.

The energy situation of Ethiopia is reviewed on the basis of relevant data. Remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

29934 **(NP—6751715) Oman - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Jan 1986. 15p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751715.

The energy situation of Oman is reviewed on the basis of relevant data. Some remarks on the country's national energy policy are followed by an outline of trends in energy sources and electric power generation. Particular interest is taken in the petroleum sector. Important figures are presented on the country's external trade. (UA).

29935 **(NP—6751716) Switzerland - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Jan 1986. 54p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751716.

The energy situation of Switzerland is reviewed on the basis of relevant data. Some remarks on the country's national and international energy policy are followed by an outline of trends in energy sources and electric power generation. Important figures are presented on external trade and the balance of payments. (UA).

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 29419, 29925, 29926, 29927, 29928, 29929, 29930, 29931, 29932, 29933, 29934, 29935, 30670

29936 **(GAO/RCED—86-50) Hazardous waste. Federal agency hazardous waste disposal at Kettlemen Hills, California.** (General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.). Dec 1985. 18p. General Accounting Office, Box 6015, Gaithersburg, MD 20877. File Number TI86901211.

Report to The Charirman, Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives.

The US General Accounting Office has agreed to determine whether federal agencies disposed of any hazardous wastes at the Chemical Waste Management, Inc., facility at Kettleman Hills, California, after the Environmental Protection Agency (EPA) had cited the facility for significant violations of environmental regulations promulgated under the Resource Conservation and Recovery Act (RCRA). Because of these violations EPA, in October 1984, banned its own use of the facility for disposal of hazardous wastes cleaned up under the Comprehensive Environmental Response

Compensation and Liability Act - commonly known as Superfund. The US GAO has also been asked to determine (1) whether federal agencies that used the Kettleman Hills facility had policies or procedures prohibiting disposal of hazardous waste at facilities with significant environmental regulation violations and (2) whether EPA has the authority to prohibit federal waste disposal at facilities with such compliance problems. The findings and recommendations resulting from this study are presented in this report.

29037 **(NP—6751714) United Arab Emirates - energy situation 1984.** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Jan 1986. 13p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751714.

The energy situation of the United Arab Emirates is reviewed on the basis of relevant data. Some remarks on the country's national energy policy are followed by an outline of the following subjects: structure of the oil and gas market, data on production and prices, developments on the gas sector, domestic consumption, oil and gas exploration. Important figures are presented on the country's external trade. (UA).

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 29210, 29225, 29228, 29245, 29245, 29246, 29254, 29261, 29937, 29937, 30012

29038 **(NP—6751720) Development potential and policies in the South Arabian countries Yemen Arab Republic, People's Democratic Republic of Yemen, Sultanate of Oman.** Hofmann, M. (Deutsches Inst. fuer Entwicklungspolitik G.m.b.H., Berlin (Germany, F.R.)). 1982. 166p. NTIS (US Sales Only), PC A08/MF A01. File Number DE86751720.

The South Arabian countries are small and economically and socio-economically among the least developed countries in the world. Nonetheless, the two Yemens and Oman have some international importance due to their position in the tense Middle East. The Arabian peninsula is likely to remain one of the world's trouble spots in the foreseeable future. Oil progressively became the determining factor in the economic development of the Arabian peninsula in the 1970s, and the shortage of labour in the oil-producing countries (including Oman) enabled the two Yemens to share in the wealth it created through the remittances of their migrant workers. Since the mid-1970s the two Yemens and Oman have received preferential treatment from the rich oil states in respect of financial cooperation (capital aid in the form of loans and grants), a commitment which is to be further increased. It is principally for the oil countries to speed up reforms aimed at improving structures in the South Arabian countries by pursuing an appropriate aid policy (conditionality). As the general change that oil has brought to the Arabian peninsula means that the two Yemens can no longer be regarded as typical LLDCs, the industrialized countries should concentrate their development cooperation with the South Arabian countries chiefly on technical assistance and planning consultancy coordinated with the wealthy oil countries. (orig./HSCH).

29039 **Review of oil shale research in Australia.** Alfredson, P.G. (Div. of Energy Chemistry, Commonwealth Scientific and Industrial Res. Organization, Private Main Bag 7, Sutherland, NSW 2232). pp 162-175 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

In the last five years, there has been a major increase in oil shale research in australia in parallel with economic feasibility studies of the exploitation of the major Julia Creek, rundle and condor deposits. The results of these studies and the status of research being carried out primarily in government and university research laboratories are summarised. The scope of this research includes geology, petrology and geochemistry of oil shales, retorting chemistry and kinetics, upgrading of shale oils and environmental studies.

29040 **The history and future of China's oil shale industry.** Du, C.; Nuttall, H.E. (Chemical & Nuclear Engineering, The Univ. of New Mexico, Albuquerque, NM). pp 210-215 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

The People's Republic of China which has abundant oil shale resources has a 50 year history of nearly continuous shale oil production. Significantly, despite the current reduction in world crude oil prices, China is still strongly committed to expanding the development of her oil shale resources. In recent years, for example, oil shale has been discovered in 22 of China's 30 provinces, including Liaoning, Guangdong, Jilin, Shandong, Shanxi, Xinjiang, Gansu, and Nei Monggol all of which have major deposits. This paper briefly describes the history of China's oil shale industry, discusses the nature of some of the more significant deposits, and compares China's oil shale properties to those of the Green River Formation. Finally, the paper also discusses China's current retorting technology as well as her plans for future expansion.

2950 Hydrogen And Synthetic Fuels

29041 **(DOE/MI/01005—T1-Exec.Summ.) Development of new business opportunities for minorities in the synthetic fuels program. Executive summary. Final report, August 11, 1980-June 27, 1981.** (Ronson Management Corp., Alexandria, VA (USA)). 1981. Contract AC01-80MI01005. 30p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86009535.

DOE's Office of Minority Economic Impact (OMEI) awarded a contract to Ronson Management Corporation (RMC) to analyze how minority business enterprise (MBE) expansion in alternative fuels could be realized. This summary and the succeeding five volumes represent RMC's findings, strategies and opportunities for increased MBE involvement.

29042 **The Mancamp Issue: Toward a good neighbor policy for major energy/minerals developments.** Leutwiler, N.R. pp 347-354 of Eighteenth oil shale symposium. Gary, J.H. Golden, CO; Colorado School of Mines Press (1985). (CONF-8504101—).

From 18. oil shale symposium; Grand Junction, CO, USA (22 Apr 1985).

A recurrent dilemma for major energy and mineral development projects is housing the project's workforce, particularly the temporary construction workforce which participates in the labor-intensive construction phase of a project. Energy and mineral development firms generally prefer to house their construction workers at the jobsite in barracks or dormitory-like "mancamps". Neighboring communities, on the other hand, often prefer to have the workers housed within the community's corporate limits, in conventional housing units. Developers of synthetic fuels projects in rural portions of the west have had to come to grips with this housing issue, often in the face of strong, diverse, and often negative feelings on the part of nearby communities. The following paper examines the mancamp issue, presenting the major arguments for and against this often controversial form of worker housing. The paper also chronicles some of the recent experiences with mancamps of communities adjacent to major synthetic fuels projects in rural portions of Colorado and North Dakota.

2960 Electric Power

REFER ALSO TO CITATION(S) 29210

29043 (CONF-8509154—Summs., pp 106-109) **Accelerated life cycle test advanced lead-acid cells at elevated temperature.** Chreitzberg, A.M.; Kelley, J.J. (EXIDE, Yardley, PA). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Optimized designs for advanced lead-acid, load-leveling batteries were selected in a limited time period by means of an accelerated life cycle test combining two 80% DoD cycles per day with a target mean test temperature of 71°C. Preprototype load-leveling cell designs were selected from 60 cell design variations in three fractional factorial test plans. Some of the successes and limitations of this accelerated test are discussed.

29044 **(DOE/EIA—0455(84)) Historical plant cost and annual production expenses for selected electric plants, 1984.** (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). 3 Apr 1986. 253p. NTIS, PC A12/MF A01; 1 - GPO; GPO Dep. File Number DE86009121.

Historical Plant Cost and Annual Production Expenses for Selected Electric Plants shows the historical plant cost of selected hydroelectric, fossil-fueled steam-electric, gas-turbine, and nuclear steam-electric plants in commercial operation by electric utilities. It also shows the annual cost (exclusive of annual fixed charges) to electric utilities of producing electric power at these plants. Historical Plant Cost and Annual Production Expenses for Selected Electric Plants presents these data for plants that were selected mainly on the basis of their net generation. Data are for 100% of plant ownership unless indicated otherwise by a footnote.

29045 **(DOE/EIA—0474(86)) Annual outlook for US electric power, 1986.** (USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels). 24 Apr 1986. 68p. NTIS, PC A04/MF A01 - GPO; GPO Dep. File Number DE86010010.

This document includes summary information on the ownership structure of the US electric utility industry, a description of electric utility regulation, and identification of selected factors likely to affect US electricity markets from 1985 through 1995. This Outlook expands upon projections first presented in the Annual Energy Outlook 1985, offering additional discussion of projected US electricity markets and regional detail. It should be recognized that work on the Annual Energy Outlook 1985 had been completed prior to the sharp reductions in world oil prices experienced early in 1986.

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 29246

29046 **(DOE/EI/06320—T2) Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume IA. Appendices with 1975 data. Final report.** (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). 15 Dec 1980. Contract AC01-78EI06320. 225p. NTIS, PC A10/MF A01; 1; GPO Dep. File Number DE86008287.

Industrial energy consumption data for US sources include DOE's Annual Report to Congress, the Monthly Energy Review, the Federal Energy Data System, and the Energy Data Reports publications, formerly titled Mineral Industry Surveys. Since the industrial sector fuel totals published by DOE differ from ECDB totals, explanations are given on how the different DOE publications derive their data and why ECDB totals vary from DOE totals. For this purpose, the Annual Report was chosen as the source of comparison to the ECDB. Of the fuel surveys conducted by the Energy Information Administration (EIA), some are voluntary and some mandatory. The response rate to the mandatory surveys is close to 100% while the response rate to voluntary surveys is lower, varying between 55% and 87%. Survey characteristics are described and the way in which inadequate survey responses are corrected by the EIA. The table numbers in the appendix correspond to the comparable 1976 tables in the separately bound Volume I summary document.

29047 **(DOE/EI/06320—T3-Vol.1) Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report.** (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). 15 Dec 1980. Contract AC01-78EI06320. 213p. NTIS, PC A10/MF A01 - GPO . File Number DE86008288.

This report is the summary document of a three-volume report. It contains an introduction followed by tables of data containing the following information: 1976 national energy consumption by industry fuel type, and end use; 1976 regional energy consumption by industry fuel type, and census division; 1976 regional energy consumption by industry fuel type, and federal regions; 1976 regional energy consumption by industry fuel type, and PAD district; 1976 state energy consumption by industry fuel type, and by state. (PLG)

29048 **(DOE/EI/06320—T3-Vol.3) 1975, 1976 Energy Consumption Data Base for the Industrial Sector. Volume 3. Computer-related documentation. Final report.** (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). 15 Dec 1980. Contract AC01-78EI06320. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008284.

This is the last of three volumes displaying and documenting the "1975, 1976 Energy Consumption Data Base for the Industrial Sector." It contains a User's Manual for the data base and the computer programs used to create the data and record it on magnetic tape in the specified format. Inquiries about the tape should be directed to Bruce Egan at the Energy Information Administration (EIA). Questions about this manual or the computer programs should be directed to Dan Tuttle of EEA.

29049 (EPRI-P—4401-SR, pp 2.1-2.6) **Service-sector electricity consumption in Denmark.** Thorbek, O. (Energistyrelsen, Copenhagen, Denmark). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The evolution of energy consumption in Denmark's service sector is discussed. Between 1979 and 1983 the average annual increase in energy consumption in Denmark amounted to 0.7%. In 1984 consumption went up by 4.6%. Adjusted for seasonal variations in the consumption of electric heating, Denmarks' electricity consumption is presently expected to rise by 3.5% annually.

29050 (EPRI-P—4401-SR, pp 3.1-3.7) **Energy use in Norway's commercial sector (1965-1983).** Sagen, J. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The EMOD-database in the Central Bureau of Statistics has used the available statistics to estimate energy use in Norway's commercial sector from 1965 to 1983. The figures on energy use have been corrected for temperature variations. The model for temperature corrections seems to over-correct to some extent, but the database should give a good overall description of energy use in the period covered. Total delivered energy (temperature corrected) to the commercial sector increased at a rate of 8% a year from 1965 to 1972. After a slump in 1973 and 1974 it increased to 63 PJ in 1979. The average yearly growth from 1972 to 1979 was 2%. After 1979, energy delivered has stabilized at a level of 63-64 PJ. Energy use in the commercial sector in 1965 was 40% of the energy use in the residential sector. It reached 50% in 1972 and has later stayed between 48 and 50%. The share of electricity has been steadily growing since 1971-72. It is, however, only after 1979 that electricity has been more economical than fuel oil (calculated with an energy efficiency of 0.8 for fuel oil and 1.0 for electricity).

29051 (EPRI-P—4401-SR, pp 4.1-4.18) **Energy use in the service sector in Sweden.** Carlsson, L.G. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The service sector (commercial and public buildings) accounts for about 19% of total building floor area in Sweden. Total heated floor area in commercial buildings has risen steadily from about 65 million m^2 in 1960 to about 135 million m^2 in 1983. Average floor area per employee has grown in spurts from nearly 53 m^2

in 1970 to 60 m^2 in 1984. Within the service sector, schools at 26% of total floor area and medical service at 17% are the largest subsectors. Total final energy consumption in commercial buildings grew from about 20 TWh in 1960 to about 43 TWh in 1977 but has declined since. The major contribution for the decline has been a sharp reduction in use of fuel oil (heavy and light), whose share of total useful energy consumption for heat and hot water has fallen from 87% in 1960 to about 45% in 1983. District heating has seen the most significant growth: its share of total useful energy consumption for heat and hot water has risen from below 5% in 1960 to about 37% in 1983. The share of electricity has also grown, especially after 1980.

29952 (EPRI-P—4401-SR, pp 5.1-5.2) **Electricity consumption in the tertiary sector (The Netherlands).** Sypkens-Smit, A.T. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Of all consumer groups such as the industrial, household, and services categories, the latter is least known but nonetheless important. The electricity consumption in the tertiary sector amounts to about 25% of the total electricity consumption in the Netherlands. The electricity consumption figures for this sector are presented.

29953 (EPRI-P—4401-SR, pp 6.1-6.12) **Electricity in the service sector of France.** Fouquet, D. (Electricite de France). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Energy consumption and energy conservation in the French service sector are discussed. The service sector share of the total end use energy was 7.9% in 1962, 11.8% in 1973, and 13.5% in 1982. The ratio between energy consumption and sector GDP dropped by about 25% between 1973 and 1983. This decrease was concentrated in the periods immediately following the oil crises in 1973-75 and 1979-81. The intermediate period (1975-1978) was characterized by a slight increase in this ratio. The ratio between electricity and GDP grew a total of 40% from 1973 to 1983.

29954 (EPRI-P—4401-SR, pp 7.1-7.7) **Energy use in the service sector in the United Kingdom.** Martyn, J. (Electricity Council, London, England). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Energy consumption (on a heat-supplied basis) in the UK service sector in 1983 was 18% above the 1963 level. This growth was second only to that of transportation among the major sectors. There has been considerable change in the fuel mix within the service sector since 1963. Coal has fallen from a 51% share (on a heat-supplied basis) to just 8%. The petroleum products share rose from 25% in 1963 to 47% in 1973 but has fallen to 31% since then. Gas has seen the largest increase, going from 9% in 1963 to 33% in 1983. The share of electricity has grown steadily from 13% to 28%. When the fuels are looked at in terms of expenditures, the share of electricity is much higher - 58% in 1983. Total electricity sales to the service sector grew at a 6.2% growth rate from 1963 to 1973; since then, the average annual growth rate has been 2.6%. Lighting is the main end-use for electricity in the service sector, accounting for an estimated 45% of use in shops, 40% in private offices, and 59% in public buildings. Space heating is the next most significant end-use, accounting for between 16% and 23% of total electricity use.

29955 (EPRI-P—4401-SR, pp 8.1-8.13) **Trends of electricity consumption in the small consumers' sector of the Federal Republic of Germany.** Schulz, E. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The final energy consumption of the small consumers' sector has been shown, until 1969, in one figure together with the consumption of private households. Since 1970 a breakdown of these two consumer groups has been made. The final energy consumption in the small consumers' sector in 1983 was 7% below the value in 1973. Within the 10-years-period a rather different development took place. In the years following the first oil price crisis of 1973 the energy consumption decreased slightly. Afterwards, it increased again and was in 1979 about 6% over the value of 1973. Due to the second oil price crisis in 1979, the final energy consumption in the small consumers, sector decreased by 16% until 1983. Its share in the total final energy consumption declined from 17.6% to 16.9%. It is obvious that tremendous efforts in energy conservation have been undertaken in the small consumers, sector. These efforts were mainly undertaken in the field of heating. The share of the final energy consumption for room and process heat in the small consumers' sector declined from about 82% in 1973 to about 74% in 1983. This process of energy conservation was accompanied by a substantial shift in the energy sources being used for final energy consumption in the small consumers' sector.

29956 (EPRI-P—4401-SR, pp 9.1-9.10) **Electricity consumption in Belgium's service sector.** Vansteelandt, G. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Electricity consumption in the commercial sector (national level) is discussed. The data are deduced from the officially published R/C energy statistics. An overview of energy consumption analyses of the commercial sector is presented. Energy consumption indicators for subsegments of the commercial sector are briefly described. In most cases, however, attention is uniquely focused on space and water heating.

29957 (EPRI-P—4401-SR, pp 10.1-10.4) **Electricity use in Taiwan's service sector.** Hsu, G. (Chung-Hua Institute for Economic Research, Taiwan). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Since 1973, the service sector has come to account for an increasing share of Taiwan's gross domestic product. Energy consumption in the service sector has grown faster (10% per year since 1965) than in the overall economy (9%), with the result that the share of the service sector has grown from 31% in 1965 to 36% in 1983. The service sector has grown even faster with respect to electricity consumption (11.5% per year since 1970 compared to 9.7% per year for the whole economy). Electricity consumption in the service sector has grown nearly twice as fast as the number of customers; this reflects the construction of larger buildings. A recent survey of the private part of the service sector shows that electricity accounts for 54% of total energy expenditures, followed by oil at 40%.

29958 (EPRI-P—4401-SR, pp 11.1-11.13) **Commercial sector energy consumption in Taiwan, R.O.C.** Tzeng, G.H.; Chang, S.H. (National Chiao Tung Univ., Taiwan). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The characteristics, structure, and pattern of commercial energy consumption in Taiwan are analyzed. The basic data were received from a questionnaire survey in 1983. The results are summarized as follows: the total energy consumption in the commercial sector is 18,008 billion kcal. Among the various kinds of energy used, electricity is 48.75%, gaseous fuel is 9.71%, oil is 41.08%, and firewood is 0.46%; electricity is used in usual lighting, advertising-signboards, air conditioning, and decorative-lighting in the promotion of sales. Gaseous fuel is used in cooking and heating-water, es-

pecially in the subsectors of hotels and restaurants. Oil is used in transportation and for the delivery of goods and services, especially in the subsector of the wholesaler and retailer; energy consumption in each subsector is closely related to the number of employees, areas of business, operating income, building types, registered capital, and types of organizations; and the energy consumed by the commercial sector of Taipei City accounts for about 40% of the national total.

29959 (EPRI-P—4401-SR, pp 12.1-12.11) **Electricity use in the US commercial sector 1960-2000.** Squitieri, R. (Electric Power Research Institute, Palo Alto, CA). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

From World War II until 1973, both employment and electricity per worker increased in the US commercial sector. Since 1973, however, employment, not electricity per worker, has driven kWh sales growth. Electricity accounts for one-third of commercial-sector delivered energy, but two-thirds of energy costs. Offices and shops together consume 40% of commercial-sector electricity. Large buildings, such as offices, hospitals, and schools, are particularly important. Buildings over 50,000 square feet represent only 4% of commercial-sector buildings, but 45% of total floorspace. Seventy-eight percent of commercial electricity goes to lighting and cooling. Space heating, which consumes 42% of total energy, consumes just 7% of electricity. Electricity's share, however, has been increasing and should continue to increase. Electricity now heats half of new US commercial buildings and claims an increasing share of the space heating market in every region of the country. Looking to the future, the authors expect about 3% annual growth in electricity consumption. Efficiency improvements, particularly in lighting and thermal storage for cooling, could flatten kWh sales, as could a slowdown in commercial-sector employment.

29960 (EPRI-P—4401-SR, pp 13.1-13.12) **Overview of electricity use in the United States service sector.** Wharton, J. (Electric Power Research Institute, Palo Alto, CA). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The service sector, or commercial sector, as it is often called in the United States, has long played third fiddle to the residential and industrial sectors in terms of the interest of utility planners, government policy makers, and energy researchers. The attention paid to the service sector is now increasing dramatically and simultaneously in all twelve of the countries represented at this International Symposium. This change has come about for the most straightforward of reasons: strong relative growth in the number of service-sector customers and volume of service-sector kWh sales. For example, during the recent period 1978-1983, kWh sales to the service sector grew 14%; to the residential, 11%; and the industrial had no growth. The service sector increased its share of the electricity market from 23.8% to 25.3%.

29961 (EPRI-P—4401-SR, pp 15.1-15.6) **Data on energy use in the commercial sector of the Federal Republic of Germany.** Suding, P.H. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

In the FRG, for energy consumption analyses on a national level there is a commonly accepted data base: the Energiebilanz. Energy balances for the FRG do exist for every year since 1950 (the latest is for 1983) and give an overview of annual energy deliveries from import or production through final demand. The Energiebilanz is a statistic of delivered energy, not because it serves the interest of the energy industry, as is sometimes concluded, but simply because those deliveries are the only dependable data available. The final demand part of the balance is fed by data from energy suppliers and from official federal statistics. The weakest part of the Energy Balance is the statistic of residential and non-residential small users. The data from industry and transport energy consumption are much harder. The federal statistical agency reports monthly energy consumption of industry in great detail. A final energy demand statistic for the transport sectors is composed from a number of suppliers and users statistics. Industrial energy demand is reported for 22 industrial sectors, transport energy demand is reported for only four sectors.

29962 (EPRI-P—4401-SR, pp 16.1-16.10) **Electricity use in the public sector - a few examples from Denmark.** Morthorst, P.E. (Risoe National Laboratory, Roskilde, Denmark). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

During the seventies Denmark experienced a rapid growth in electricity consumption. The development in average electricity consumption (including net losses) per capita in Denmark from 1970 to 1984 is shown. Except for 1974, the year of the first oil crisis, the per capita increase in consumption of electricity was about 7% per annum until 1979, the year of the second oil crisis. At that time growth in electricity consumption stagnated and remained at the same level until 1984, when growth was a little less than 4%. Total electricity consumption in Denmark in 1984 was 23.6 TWh (excluding net losses). The split between the main categories of consumers is shown. The commercial and service sector consumes a little less than 1/3 (6.5 TWh in 1984), and this share has been slightly increasing the last years.

29963 (EPRI-P—4401-SR, pp 17.1-17.6) **Disaggregating the service sector: survey results from Denmark.** Thorbek, O. (Energistyrelsen, Copenhagen, Denmark). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

It is difficult to clearly understand the development in electricity consumption in the service sector by means of macroeconomic relations such as GDP or the elasticity of electricity prices. The Danish Energy Agency is trying, at a disaggregated level, to find another method of examining and forecasting trends in the electricity requirement of the service sector. The retail sector has the highest ratio of electricity consumption to GDP. The retail sector is divided into two main categories: shops selling everyday commodities and food with a relatively heavy consumption of electricity, and other shops with a relatively small consumption of electricity. On the basis of an extensive examination of the sector in 1980 it was found that the total area of shops selling everyday commodities amounted to 2 million m^2 in 1980, and their consumption of electricity amounted to approximately 850 GWh; their specific electricity consumption thus amounted to about 425 kWh/m^2. The electricity consumption of the retail shops, viewed as a residual, amounted to 550 GWh.

29964 (EPRI-P—4401-SR, pp 18.1-18.10) **Data collection in the service sector.** Moen, J. (Oslo Lysvaerker, Norway). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

In 1981 a firm of consultants was engaged by Oslo Electricity Works to make a detailed study of energy consumption in the service sector. The study was carried out by personal visits, telephone calls, and distribution of questionnaires. In addition, the consultants used data from Oslo's municipal central property register and from the Electricity Work's customer information system. The survey covers most of the large energy consumers, but medium and small consumers are underrepresented. Nevertheless, scaling-up was possible so that total consumption in the service sector can be given for subgroups and in total. All figures are referred to 1980 and represent gross energy supplied. Total energy consumption was found to be 3660 GWh/yr, divided between electricity [2000 GWh/yr] and oil [1360 GWh/yr]. Energy consumption per employee (after

deduction of transportation) averaged about 13,000 kWh/yr. This equals an annual outlay of NOK 3000 (approximately US$333) on energy per employee. By units of area, annual energy consumption averages about 350 kWh m^2. Annual consumption for buildings used solely for offices varies between 150 kWh and 900 kWh m^2. Energy consumption is shown by sectors.

29065 (EPRI-P—4401-SR, pp 19.1-19.11) **Getting end-use load shape data for commercial buildings - the energy information project at Sierra Pacific Power Company.** Caldwell, R.W. (Sierra Pacific Power Company, Reno, NV). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The purpose of this study was to provide information on Sierra's approach to forecasting electric use in the service sector. Some background information is provided relating to the rationale for spending substantial amounts of money to acquire local, metered end-use data in the form of load profiles. How Sierra presently forecasts loads in the commercial sector is discussed, as well as how to evaluate the probable cost effectiveness and penetration of new, demand-side measures. A description of the Energy Information Project is presented including the hardware used, the central data base which represents the heart of the system, comments on the present status and 1985 objectives, and some examples of results to date. The Energy Information Project is a project developed to gather end-use profile data and building, equipment, and other data for customer categories and end-uses which are most important for end-use forecasting and demand-side planning at Sierra.

29066 (EPRI-P—4401-SR, pp 20.1-20.13) **Results from the Non-Residential Buildings Energy Consumption Survey (NBECS).** Oliver, J. (Dept. of Energy, Washington, DC). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The NBECS was designed and developed and is now being analyzed by the Office of Energy Markets and End Use (EMEU). This is the first time that either the public or private sector has developed a method of collecting data on a statistical sample of nonresidential buildings across the country. Data are reported on square footage and on consumption and expenditures for natural gas and electricity for commercial buildings in the contiguous United States. Commercial buildings includes all nonresidential buildings with the exception of those where industrial activities occupy more of the total square footage than any other type of activity. Nonresidential buildings has been defined as roofed and walled structures which house some kind of commercial or industrial activity. Buildings which were primarily residential but showed evidence of commercial or industrial activities are also within the scope of the survey.

29067 (EPRI-P—4401-SR, pp 21.1-21.7) **Monitored energy performance of new and retrofitted buildings: some results from the BECA data compilations.** Meier, A.K. (Lawrence Berkeley Lab., CA). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

A great variety of technologies to save energy in buildings have been developed and implemented. Most of these new techniques have been justified on the basis of theoretical calculations or simulations rather than measured energy consumption. Others have been field-tested under very limited conditions. Yet, conservation strategies successful in theory may not be successful in practice, owing to poor quality control, rapid degradation in performance, or user-resistance. It is essential to monitor the performance of low-energy technologies in the field as a means of providing feedback to the buildings community. Three issues are addressed: which measures save energy, do the measures save as much as predicted, and which measures are cost-effective? The Buildings Energy Data Group seeks to increase the energy efficiency of buildings and equipment by compiling measured performance data and disseminating analyzed results to the buildings community. BED presently collects data and maintains five major data bases. These data bases are called Building Energy-Use Compilation and Analysis, or BECA. The BECA data are discussed.

29068 (EPRI-P—4401-SR, pp 23.1-23.8) **Energy use in the commercial sector: the Norwegian energy consumption system and physical/technical energy models.** Grinden, B. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The commercial sector in Norway has a large share of electricity of the energy consumption in the sector. This is due to cheap hydroelectric power. Most of the energy consumption is used for space heating. EFI-ENERGI is a physical/technical model used for forecasting/analyzing energy consumption. For the commercial sector, poor statistics cause problems with calibration of the model for the base year. Important factors in forecasting the energy consumption of the commercial sectors are: employment, floor area per employee, building insulation, space heating systems, heat recovery, ratio of oil price to electricity price, private and public consumption index. The amount of surplus power available in the future can affect the energy distribution between oil and electricity. The peak load demand will probably increase, but it is difficult to draw any conclusions about the load curve shape and the load factor.

29069 (EPRI-P—4401-SR, pp 24.1-24.5) **Forecast for energy consumption in the service sector.** Moen, J. (Oslo Lysvaerker, Norway). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

For its forecast calculations Oslo Electricity Works has used the energy forecast model EFI-ENERGI. A characteristic of EFI-ENERGI is that it is a technical simulator model, i.e., it calculates the energy consumption for the specified technical/physical system. It is a subsequent energy model, i.e., the community development pattern must be given, and the model calculates energy consumption on that basis. It is suitable as a consequence model because it contains many parameters that can be varied so that the consequences for energy can readily be found by altering the data for one of the quantities. It is also suitable for local energy planning. The total model is divided into five sector models, one for each of the areas: households, services, industry, transport, and miscellaneous. Within each of these sector models, energy consumption is calculated on the basis of a technical description of the energy-consuming system. By this is meant the quantities or extent of the energy-consuming sectors and technical devices that perform work (for example, heating systems in the homes).

29070 (EPRI-P—4401-SR, pp 25.1-25.8) **Utility perspective on commercial sector markets.** Wallenberg, B. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

In Sweden, municipalities are given a fairly far reaching responsibility regarding planning for the total energy balance within their domains. Thus, they have to establish detailed plans for how they want to supply the municipality with energy in its different forms: electricity, different fuels for district heating, etc. The plan is also to show how the energy is thought to be consumed and what degree of balance can be struck between consumption and conservation. Such plans terminate in the local parliament for decision. The municipality generally has a utility responsible for distributing energy over stationary distribution systems, e.g., district heat, electricity, and gas. The utility sells its different forms of energy in a monopoly situation under internal competition. The business idea, given the fact of the monopoly, is to sell the services as inexpensively, as reliably, and as environmentally clean as possible. The

system incorporates a heat-mapping scheme, which means that for different areas within the municipality, the utility designs which of the three energy forms will be the basic heat source for each area. The scheme stems from a minimization of the total costs in the area, for the customer as well as for the utility.

29971 (EPRI-P—4401-SR, pp 26.1-26.15) **Models of the US service sector.** McMenamin, J.S. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Prior to the mid-1970's, energy utilities in the US found service sector customers either too diverse, too numerous, or too complex to model, except in aggregate terms using single-equation techniques. Although this approach provided planning projections based on historical relationships, it offered little insight into the way that energy was used in the service sector, and it provided no information on how this pattern of energy use might change in the future. A family of commercial-sector end-use models was developed in response to the need to better understand the pattern of energy sales in this sector and to put into perspective how government and utility programs might alter this pattern. One member of this family is the COMMEND End-Use Planning System. Using COMMEND, utilities can disaggregate commercial buildings into a manageable number of homogeneous groups and can analyze the pattern of energy sales and electricity loads in each group. The model comes in the form of mainframe software and ten regional data bases. The model has been installed by about 25 utilities. The model is described.

29972 (EPRI-P—4401-SR, pp 27.1-27.8) **Directions in commercial sector electricity forecasting.** Pastuszek, L.M. (New England Power Service Co., Westborough, MA). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The New England Electric System (NEES) has three retail subsidiaries operating in three states. In 1984, there were sales of energy to ultimate consumers of 39% residential, 33% commercial, and 27% industrial. About 74% of these sales were to Massachusetts Electric customers, 23% to Narragansett electric customers, and 3% to Granite State Electric customers. The system sold 16,636 million kWh in 1984 and experienced its all-time peak of 3379 MW in June, 1984. An all-time winter peak of 3314 MW occurred in January, 1985. The system began its transition to a summer-peaking system in the mid-70's; this summer-peak trend is projected to persist into the future, largely due to the growth of the commercial sector, which accounts for about 45% of the summer peak. Up until 1973, NEES loads increased on the order of 6 to 7% per year. Due to the oil embargo and its consequent price impacts, as well as a general slowing of the economy, growth since 1973 has averaged less than 2% annually. Sales to commercial customers increased an average of 2.3% annually during the 1973-1984 period; sales to industrial customers averaged 1.5%, and to residential customers, 1.7%, over the same period. Commercial sales have tended to be less cyclical over this period than are the other classes, less sensitive to business cycles than the industrial class, and less sensitive than residential sales to weather patterns. The use of the COMMEND model for analyzing commercial electricity sales is discussed.

29973 (EPRI-P—4401-SR, pp 28.1-28.4) **Forecasting at Sierra Pacific Power Company.** Caldwell, R. (Sierra Pacific Power Co., Reno, NV). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Care is required in designing the categories of commercial customers to be considered in analysis. The use of rate classes falls well short of the mark, since such categorizations are not made for analysis but for other reasons. The nature of load characteristics, potential operator or owner actions to change such characteristics, and the potential for utility-sponsored changes, are the things which forecasters and planners need to examine. Categorization of customers for analysis must be done with such in mind. Sierra categorized all its customers into 17 basic groups. For commercial customers, the categories were: office, restaurant, retail other, grocery, warehouse, school, health, hotel/casinos, and miscellaneous. The commercial end-use demand forecasting model, COMMEND, developed by EPRI, was used to forecast commercial-sector sales. The model provides forecasts of energy sales by end-use and fuel type as a function of employment, fuel prices, energy policies, and programs, and available energy-efficiency options. The structure of the model makes it particularly well suited for analyzing the effect of demand-side programs on energy sales.

29974 (EPRI-P—4401-SR, pp 29.1-29.2) **Forecasting electricity use in the service sector.** Canning, A. (Southern California Edison Co.). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Southern California Edison (SCE) is one of the largest electric utility companies in the US. Peak demand (which occurs in summer) in 1984 was over 15,000 MW, and 1984 sales totaled 62,200 GWh. SCE's 330,000 commercial and government customers accounted for 29% and 8% respectively of 1984 sales. An important component of SCE's forecasting process is energy intensity in terms of kWh per square foot of floor area. This quantity grew considerably between 1965 and 1970 but then declined through 1982. Using that historical trend as a basis, the California Energy Commission (CEC), which prepares independent forecasts of utility peak demand and sales, forecast continued decline in kWh use per square foot. What actually occurred was a sharp increase in 1983 and 1984. In its own more recent forecast, SCE sees intensity remaining at slightly higher than the 1984 level through 1990. The lesson here is that electricity consumption in the service can and does behave in a way that makes the use of forecasts a tricky business.

29975 (EPRI-P—4401-SR, pp 31.1-31.2) **New electricity-using technologies in Swedish buildings.** Abel, E. (Chalmers Univ. of Technology, Goeteborg, Sweden). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

When discussing energy matters, a clear distinction must be made between the two fundamentally different energy forms, heat and work; the latter is usually distributed in the form of electrical energy. In principle, work, and of course, also work in the form of electrical energy, can be regarded as the quintessence of energy - energy in its most valuable form. Thus, it should at first hand, be utilized for more advanced purposes as driving machines, lighting etc. However, when one has access to electrical energy, it is quite natural to use it for less sophisticated purposes as well, e.g., heating of buildings. Such utilization of electricity can also be justified on a greater scale, if the production of electrical energy is not too much dependent on burning of fuels, and if the system of transmission lines has sufficient capacity. Energy Consumption in Sweden is discussed.

29976 (EPRI-P—4401-SR, pp 32.1-32.15) **Attractive economics of thermal storage in new buildings.** de la Moriniere, O. (Lawrence Berkeley Lab., CA). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

The manager of a building, wanting to decrease his operating costs, in addition to energy conservation, has to get involved in reducing peak demand. One way to do so is to use cool storage to shift to night time all or part of the peak cooling profile, thus allowing substantial savings. To cool a building, a manager can choose among three systems, a conventional chiller, partial storage,

or demand-limited storage, so he has to compare the following options: (1) installing a partial storage versus a conventional chiller, (2) installing a demand-limited storage versus a conventional chiller, and (3) installing a demand-limited storage versus a partial storage, which is the most sophisticated question. A comparison of these options is presented.

29977 (EPRI-P—4401-SR, pp 33.1-33.5) **Improving energy performance in office buildings: institutional behavior.** Penz, A. Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

Energy costs account for 35% of total operating expenses in US office buildings. Yet the economic power of energy is small relative to other expenses. A typical tenant pays $100/sq ft for office space; energy accounts for less than 2$/sq ft, while direct labor expense costs some $75/sq ft. Thus, if changes to lower energy costs have a potentially negative effect on labor productivity, they will be very unattractive. Conversely, if energy saving measures improve productivity, they become very attractive. Measures to increase energy performance in office buildings are discussed.

29978 (EPRI-P—4401-SR, pp 34.1-34.20) **Analysis of energy conservation standards for Singapore office buildings.** Turiel, I.; Curtis, R.; Levine, M.D. (Lawrence Berkeley Lab., CA). Jan 1986. NTIS, PC A17/MF A01 - Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number DE86006783. (CONF-8503217—).

From International workshop on electricity use in the service sector; Palo Alto, CA, USA (18 Mar 1985).

In 1979, the Singapore government established energy conservation standards for new commercial buildings. These standards consist of maximum allowable lighting loads and overall thermal transfer values (OTTV) of the building envelope and roof. Owners of existing buildings may write off in one year the cost of conversion work to conform to the prescribed OTTV. Consumers of electricity in buildings that have not achieved the prescribed standard must pay a surcharge of 20% tax on electricity bills as of 1 January 1982. Under the second ASEAN-US Energy Project, Singapore was designated the focal point for the subproject on Energy Conservation in Buildings. In the latter part of 1982, members of the Energy Analysis and Energy Efficient Buildings Programs of Lawrence Berkeley Laboratory initiated a joint effort with the Singapore government to assess the effectiveness of the present Singapore standards for office buildings and to update these standards where appropriate. This joint effort is described.

29979 (DOE/EI/06320—T3-Vol.2-Pt.1) **Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report.** (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). 15 Dec 1980. Contract AC01-78EI06320. 148p. NTIS, PC A07/MF A01; 1 - GPO; GPO Dep. File Number DE86008286.

Included in this report is a complete documentation of the sources used and steps taken to produce the data that appears in the ECDB. The documentation has been written in a detailed fashion so that each piece of data can be reproduced. The documentation of the data base is presented in this volume for each of three major industrial divisions: the agricultural sector, mining, and construction. Agriculture is subdivided into Forestry (Section 2.2) and Fishing, Hunting, and Trapping (Section 2.3). Crops and Livestock (including agricultural services) were documented separately for EIA by the Department of Agriculture.

29980 (DOE/EI/06320—T3-Vol.2-Pt.2) **Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report.** (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). 15 Dec 1980. Contract AC01-78EI06320. 656p. NTIS, PC A99/MF A01; 1; GPO Dep. File Number DE86008285.

The purpose of this report is to provide adequate documentation of the ECDB so that the reader can reproduce all data pertaining to SIC 26 exactly as it is contained in the data base. First, a general methodology is presented, accompanied by flow diagrams which provide the reader with a general overview of the methods and sources employed in developing the 1975 and 1976 data base. The data quality and consistency with previous years' ECDB data is also evaluated. The detailed methodology follows, explaining, step by step, how consumption, expenditure, and functional use data for the paper industry were determined. A completed list of data input files referred to in this section is included. These are fully documented, giving sources, derivation, and exceptions to the general derivation procedure.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 29461, 29465, 29476, 29477, 29482, 29619, 29628, 29635, 29641, 29908, 29910

29981 (CONF-8509142—, pp 21-24) **Geothermal activities in Central America.** Whetten, J.T.; Hanold, R.J. (Los Alamos National Lab., NM). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

The Agency for International Development is funding a new program in energy and minerals for Central America. Geothermal energy is an important component. A country-wide geothermal assessment has started in Honduras, and other assessment activities are in progress or planned for Costa Rica, El Salvador, Guatemala, and Panama. Instrumentation for well logging has been provided to Costa Rica, and a self-contained logging truck will be made available for use throughout Central America. An important objective of this program is to involve the private sector in resource development. 4 references, 3 figures.

29982 (CONF-8509142—, pp 27-31) **SAN overview/discussion of heat cycle research.** Adduci, A.J. (Dept. of Energy, San Francisco, CA). 1985. NTIS, PC A09/MF A01. File Number DE86004074.

From Geothermal program review; Washington, DC, USA (11 Sep 1985).

DOE's San Francisco Operations Office's Fossil, Geothermal, and Solar Division programs and projects are summarized. Among those programs and projects are: geothermal reservoir technology, geochemical engineering and materials, state cooperative programs, geothermal technology transfer, Heber binary geothermal power plant, Salton Sea scientific drilling project, the Navy/DOE geothermal cooperative agreement, the Geothermal test facility, international (w/Mexico, Italy) agreements, the Hawaii geothermal plant, and the geothermal pump development program. 10 tables.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

REFER ALSO TO CITATION(S) 31267

29983 **Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag.** Marchant, D.D.; Griffin, C.W.; Bates, L.J. (Battelle, Pacific Northwest Labs., Richland, WA). *American Ceramic Society Bulletin;* 63: No. 4, 619-627(Apr 1984). Contract AC06-76RL01830.

Iron-magnesium-aluminum spinel (nominally 0.25 Fe_2O_3-0.75 $MgAl_2O_3$) (FMAS) was tested both chemically (control) and electrochemically (anode and cathode) to determine if it could withstand conditions associated with magnetohydrodynamic (MHD) generators. The spinel was corrosion tested in two molten potassium salts (K_2CO_3 and K_2SO_4) and two coal slags. Corrosion rates were greater in the cathode and anode tests than in the control test. Post-test microstructures were examined with optical and scanning electron microscopes. Chemical composition was determined by semiquantitative analyses of some of the microstructural features

using the energy dispersive X-ray technique. Chemical compositions of the post-test phases were generally different in the cathode than in the anode or the control.

3005 Fuel Cells

29984 **Integrated current collector and catalyst support.** Bregoli, L. J. (to The United States of America as represented by the United States Department of Energy). US Patent 4,548,876. 22 Oct 1985. Filed date 17 Oct 1984. vp.
PAT-APPL-661851.

An integrated current collecting electrode for a molten carbonate fuel cell includes a corrugated metal conductive strip positioned in contact with a catalyst layer. The corrugations of the metal strip form a plurality of gas channels immediately adjacent the surface of the catalyst through which a reactant gas flows. Each channel is filled with a particulate material to maintain separation between the metal strip and the catalyst in ensuring gas channel integrity. The catalyst may be in the form of a compacted, particulate material provided the particle size of the material within the gas channels is larger than that of the catalyst particles to prevent catalyst migration to the metal conductor and provide reactant gas access to the catalyst layer. The gas channels formed by the corrugations of the metal strip are arranged in an offset pattern along the direction of gas flow for improved reactant gas distribution to the catalyst layer. The particulate material positioned within the gas flow channels may be ceramic conductor such as a perovskite or a spinel for enhanced current collection.

29985 **Electrolyte reservoir for carbonate fuel cells.** Iacovangelo, C. D.; Shores, D. A. (to The United States of America as represented by the United States Department of Energy). US Patent 4,548,877. 22 Oct 1985. Filed date 23 May 1984. vp.
PAT-APPL-612951.

An electrode for a carbonate fuel cell and method of making same wherein a substantially uniform mixture of an electrode-active powder and porous ceramic particles suitable for a carbonate fuel cell are formed into an electrode with the porous ceramic particles having pores in the range of from about 1 micron to about 3 microns, and a carbonate electrolyte is in the pores of the ceramic particles.

29986 **Coated powder for electrolyte matrix for carbonate fuel cell.** Iacovangelo, C. D.; Browall, K. W. (to The United States of America as represented by the United States Department of Energy). US Patent 4,540,640. 10 Sep 1985. Filed date 29 Apr 1983. vp.
PAT-APPL-489431.

A plurality of electrolyte carbonate-coated ceramic particle which does not differ significantly in size from that of the ceramic particle and wherein no significant portion of the ceramic particle is exposed is fabricated into a porous tape comprised of said coated-ceramic particles bonded together by the coating for use in a molten carbonate fuel cell.

29987 **The role of heat transfer in molten carbonate fuel cell performance.** Wilemski, G.; Wolf, T.L. New York, NY; American Institute of Chemical Engineers (1985). 39p. (CONF-841121—). American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017.
From AIChE annual meeting; San Francisco, CA, USA (25 Nov 1984).

The authors describe the heat and mass transfer schemes used in the numerical modeling of large, nonisothermal molten carbonate fuel cell stacks. The model is used to compute detailed spatial distributions of temperature, current density, reactant utilizations and compositions, and voltage losses in addition to average thermal and electrical performance characteristics. The heat transfer model includes the effects of i) convection by the two gas streams, ii) conductive heat transfer between the gas streams and the cell hardware, iii) in-plane heat conduction through the cell hardware, iv) exchange of gas at different temperatures between the flow channels and porous electrodes, and v) heat release or absorption arising from the electrochemical reactions and anode fuel stream chemistry.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

29988 **STES newsletter: a quarterly review of seasonal thermal energy storage.** *STES (Seasonal Thermal Energy Storage) Newsletter;* 7: No. 1, 1-6(Dec 1984). Contract AC03-76SF00098.

Articles from France, Denmark, Poland and the US, ranging from modeling studies of field experiments to practical installation of seasonal storage, show promising results. The French report a coupled hot and cold water underground storage system in Paris; the Danes an aquifer thermal energy storage project; and the Poles a membraneless ground heat and mass exchanger. The US reports on a three-dimensional, nonisothermal, anisotropic model for ground water flow and thermal energy transport for simulating short-term tests at a University of Minnesota project. Contact names and addresses appear at the beginning of each report. 9 references, 2 figures, 1 table.

3201 Buildings

REFER ALSO TO CITATION(S) 29498, 29589, 29967, 29970, 29976, 29977, 29978, 30498, 30542

29989 **(BFR-R—109-1985) Vertical recirculation-type evaporators. An investigation of heat transfer and refrigerant circulation.** Karstroem, A. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1985. 69p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751682.

Heat pumps using lake water as heat source often incorporate falling film type evaporators. These are evaporators which consist of vertical panels (or tubes), over the outside of which water is allowed to flow in the form of a falling film. The refrigerant is evaporated inside the panels/tubes and circulates by gravity. An objective of these tests has been to contribute to an improved design basis for evaporators of this type incorporating vertical tubes. In particular, the work has concentrated on heat transfer and flow conditions in the refrigerant circuit, with R12 being used as the test refrigerant. Several different tube arrangements have been tested, and the results are described in the report. Another objective of the tests has been to investigate the characteristics of an evaporator built in accordance with a design principle in which liquid refrigerant is supplied to the evaporation through an internal connection. This eliminates external tubes and connections at the bottom of the evaporator for liquid refrigerant. The design principle was found to work as intended, and makes it possible to build the evaporator tubes with free bottom ends, which should be a definite advantage for cleaning and when dealing with water leaving the bottom of the evaporator at a temperature near the freezing point. The report also describes the results from tests with a model evaporator of this type.

29990 **(BFR-R—114-1985) Secondary refrigerants for heat pump applications. Studies of thermodynamic properties and corrosion.** Melinder, Aa. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1985. 104p. (In Swedish). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751683.

It is appropriate to use an indirect system in which a refrigerant is employed to extract heat from the heat sources. E.g. in conjunction with heat sources of seasonal storage characteristics such as soil rock. It is difficult to find a liquid which is in all respects ideal as secondary refrigerant for temperatures below 0 degrees C. Corrosion and environmental characteristics are of great importance. The thermodynamic characteristics needed for calculations of heat transfer and pressure drop have been set out in the report for comprising water with freezing point depressants such as ethylene glycol, propylene glycol, ethanol, sodium chloride and calcium chloride. Investigations have also been made regarding a secondary refrigerant consisting of an aqeous solution of potassium carbonate. Diagrams are given for density, freezing point, viscosity, thermal conductivity and specific heat capacity. The corrosion characteristics of The corrosion characteristics of aqueous solutions

of ethylene glycol, calcium chloride, ethanol (brineol) and potassium carbonate were determined. The following results of the corrosion tests may be mentioned: - In all tests, ethylene glycol (with a commercial inhibitor) was found to have favourable corrosion characteristics, - With the proposed inhibitor, ethanol (brineol) gave rise to difficulties such as heavy frothing. Without the inhibitor, corrosion on the steel components is unacceptably high, - Calcium chloride solutions with a suitable inhibitor and a controlled pH value are a possible substitute for ethylene glycol from the corrosion point of view, but in the event of a leak they cause extensive corrosion externally, - Solutions of potassium carbonate, with their relatively high pH values (approx 12), have favourable characteristics in conjunction with steel, but systems containing copper and brass require inhibitors.

29091 **(BFR-R—117-1985) Analysis of energy consumption in administrative buildings.** Aronsson, R.; Hedberg, H.O.; Nylund, P.O. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1985. 68p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751684.

The objective of this work has been primarily to develop methods of investigating the 'energetics' of a building, defined as physics associated with energy conversion. The report entitled 'Analysis of Energy Consumption in Administration Buildings' describes the results of a project planned in 1980/1981, and is which the experimental work was carried out during the winters of 1981/1982 and 1982/1983. From the time of planning the work until completion, the project has both generated and been supplied with additional knowledge, which has meant that we have now come a good way to understanding how individual buildings work from an energy viewpoint. The project has been concerned with five administration buildings for the National Board of Public Building's own buildings in Stockholm. The report describes a development along two parallel lines. One extends from simple rough manual calculations to detailed calculations, with allowance for internal heat exchange through heat storage mechanisms. The other extends from consideration of energy consumption (energy balances) over long periods of time to investigation of brief consecutive periods of time, towards development of investigation of power consumption. The latter method of working has been found to have considerable advantages in attempting to explain how buildings work in energy terms. The development of experimental and theoretical methods of analysis has reached such a stage that the main features of practical application in the form of aspects such as operational and energy monitoring are beginning to take clear form.

29092 **(BFR-R—118-1985) Stockholm project. Quality control of energy-efficient settlement.** Nilsson, J. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1985. 48p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751685.

Over the past five years the City of Stockholm has stepped up its active participation in research and development work in the energy sector. This is described in 'Energy Programme for Stockholm', which comprises seven outline projects. One of these outline projects refers to energy-efficient new settlement and among other things includes: - An experimental building project, The Stockholm Project, entailing five subprojects, - Comparative analyses of the energy requirements of buildings having different form factors, - Development of quality control. The present report is a pilot study in the field of quality control, and it describes the stages in the building process, from programme to operation/maintenance, at which it is feasible to introduce stipulations and where, as well as by whom, these stipulations can be followed up. The account conveys a picture of the structure of responsibility prevailing in a building project and it indicates the role and significance of different parties in connection with the final quality of a building. The project results are being developed further in the Stockholm Project - Sjukskoeterskan (Nurse) precinct - in which they are supplying input documentation for discussion of quality together with builders on the Souther Station site and elsewhere in Stockholm. The need for efficient quality control is growing parallel to efforts to reduce the energy requirements of new settlement.

29093 **(BRE-IP—8/85) Assessment of the cost-effectiveness and potential of heat pumps for domestic hot water heating.** Grigg, P.F. (Building Research Establishment, Watford (UK)). May 1985. 4p. Publications Sales Office, Building Research Establishment, Garston, Watford WD2 7JR.

The cost of and savings resulting from the use of a heat pump designed for heating only domestic hot water, as a replacement for conventional means, are assessed using data obtained from laboratory testing of a typical machine. The circumstances in which the heat pump would be cost-effective are indicated, with the most promising potential markets in commercial premises and in dwellings with a high hot use. (author).

29094 **(BSRIA-TN—6/85) Heat metering for domestic premises.** Eastwell, A.S. (Building Services Research and Information Association, Bracknell (UK)). Aug 1985. 21p. Building Services Research and Information Association, Old Bracknell Lane West, Bracknell, Berks, RG12 4AH, price Pound 15.00.

The use of heat meters for monitoring heat consumption in Group, District or CHP (combined heat and power) schemes is described. Although primarily intended to cover domestic applications much of the content is relevant to larger scale applications such as boilerhouse monitoring. Manufacturers and models are listed and those features considered important in selecting the correct product are highlighted. (author).

29095 **(BSRIA-TN—7/85) Factors influencing boiler efficiency.** Walker, D.C. (Building Services Research and Information Association, Bracknell (UK)). Aug 1985. 14p. Building Services Research and Information Association, Old Bracknell Lane West, Bracknell, Berks, RG12 4AH, price Pound 15.00.

A numbers of factors and actions are discussed which can lead to improved boiler efficiency through better combustion, reduced losses, higher part loads efficiencies and the application of energy conservation measures. A general guide to the sort of improvements which can be expected is outlined. (author).

29096 **(ETY—3/1983) Calculation of the consumption of electric energy in buildings.** Koski, P. (Finnish Energy Economy Association, Helsinki). 1983. 62p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751660.

The study discusses the factors affecting the consumption of electric energy in buildings. Further, it presents a method to calculate the consumption and to find out the division of the total consumption between different equipment groups (lighting, fans etc.). The calculation is made manually. The model is presented in such a form which could serve both those responsible for energy consumption and saving activities, and electric engineers in calculating the consumption of electric energy and estimating its division. When testing the model it was noticed that the consumption estimation made by the prefilled values is in many cases a goal value. If this is exceeded the calculation should be adjusted in order to find out the reasons of the greater energy consumption and to make the possible saving measures.

29097 **(ETY—8/1983) Energy economical pilot projects in building industry.** Erkioe, E. (Finnish Energy Economy Association, Helsinki). 1985. 65p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751664.

The experimental energy economical construction work has taken place in the wider scale during the last few years. Despite of the fact that the variety of the results gathered in the first projects did not reach the target, plenty of new data was revealed through them. The failures mainly were caused by insufficient research conditions of the first pilot projects. The need for energy economical pilot projects is evitable as it is the only way of examining in practise the problems concerning building energy economics. Founded on experience from the former pilot projects, the purpose of study, the applicability of the construction project for a pilot project and the creation of the appropriate research conditions are to be taken more into consideration in the future. Thus the money preserved for experimental construction projects in the near future should be

spent on the preliminary phase of the selected pilot projects placing the emphasis on the research fields which have importance according to the previous studies. The next pilot projects in building industry should concentrate on: the requirement - controlled energy use in heating, ventilation and lighting and the energy economical rehabilitation of the earlier built building stock both on the technical and on the administrative point of view.

29998 **(ETY—10/1984) Compensation of reactive power in buildings.** Koski, P. (Finnish Energy Economy Association, Helsinki). 1985. 77p. (In Finnish). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751666.

The choice of the most economic method for compensation of reactive power in buildings often has to be made individually in each case, as it is not possible to give accurate rules for it. In this study the factors affecting the choice have been discussed and advice for choosing the most profitable method have been given. Also the need of reactive power, the profitableness of the compensation and its estimation have been dealt with. The costs of an electrical network in a building and the energy losses in it depend on the choice of the compensation method. These were studies in an office building which was selected as an example. The power loss in the network was about 2.2% of the peak power of the building, that is 0.21 W/m³. The costs of the network were about 0.27 FIM/m³ higher when using centralized compensation than with individual compensation of lamps. It was estimated that if individual compensation of lamps were in all schools, hospitals and commercial and office buildings built yearly in Finland, savings in the cable costs would be about FIM 2 million per year, compared with the cable costs with centralized compensation. In addition, savings in the costs of distribution boards and electrical rooms would be achieved.

29999 **(KTM/E-D—90) Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study.** Tuunanen, P.; Railio, J. (Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.). 1985. 65p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751650.

The performance and functioning of the ventilation system as well as the energy-efficiency are determined to a greater extent by the system design and construction than by the equipment and the components. Accordinly, the pilot study was made in the form of a questionnaire to professionals working as builders, designers, contractors and in operation and maintenance. The purpose was to find out the main problems of ventilation and suggestions for avoiding these problems. Although the work was focused on technical matters it was necessary also to discuss some administrative questions. The potential of energy-saving in newbuilding and renovation is estimated to be about 300 GWh annually. Also, more efficient maintenance results in extra saving. In the course of time the energy consumption in the whole building stock can be reduced by about 10 kWh/m³ annually, which would mean about 2000 million FIM. Advanced energy-efficient ventilation can also secure a better indoor climate and extra profit would be gained in health and comfort though the value of this is difficult to estimate.

30000 **(LBL—17585) Description of ASHRAE's proposed data tightness standard.** Sherman, M. (Lawrence Berkeley Lab., CA (USA)). Mar 1986. Contract AC03-76SF00098. 32p. (CONF-841049—2). NTIS, PC A03/MF A01; GPO Dep. File Number DE86009360.

From 5. AIC conference on the implementation and effectiveness of air infiltration standards in buildings; Reno, NV, USA (1 Oct 1984).

Because the load due to air infiltration typically accounts for one-third of space conditioning loads, ASHRAE (American Society of Heating, Refrigeration and Air-conditioning Engineers) is in the process of writing a standard which addresses the maximum leakage associated with good construction. This standard, SPC 119P, is a link between ASHRAE Standard 90, which addresses energy conservation in new residential construction, and Standard 62, which specifies the minimum acceptable ventilation to achieve adequate indoor air quality. Within Standard 119 there is currently a classification scheme that groups building tightness into categories depending on envelope leakage, floor area and building height. In addition to being used for this residential leakage standard, this classification scheme is intended to be used to label the tightness of any building residential or commercial, new or existing. This report will present the background around SPC 119P, indicate a proposed form that the standard may take, and present some of the rationale behind it.

30001 **(LBL—18306) Monitored performance of new, low-energy homes: updated results from the BECA-A data base.** Busch, J.F.; Meier, A.K. (Lawrence Berkeley Lab., CA (USA)). Mar 1986. Contract AC03-76SF00098. 20p. (EEB-BED—85-11; CONF-850306—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009904.

From Solar energy conference–1985; Knoxville, TN, USA (25 Mar 1985).

We compiled and analyzed energy consumption data, construction details, and operating characteristics for over three hundred new, low-energy homes. Over two thirds of the buildings incorporated solar features. A sequence of standardization procedures were developed to compare the energy performance of the buildings. The procedures adjusted the reported heating energy consumption for variations in the climate, floor area, internal gains, and reported indoor temperature. Two indicators of thermal performance were developed, the balance temperature and a k-value, which roughly corresponds to the overall UA of the building but also includes the ability of the house to exploit solar gains and thermal mass. The buildings in the data base have an average balance temperature of 12°C and a k-value of 114 W/°C. Earth-sheltered buildings perform best, but only slightly better than passive solar and superinsulated buildings.

30002 **(LBL—18732) Air leakage flow correlations for varying house construction types.** Kiel, D.; Wilson, D.; Sherman, M. (Alberta Univ., Edmonton (Canada). Dept. of Mechanical Engineering; Lawrence Berkeley Lab., CA (USA)). Mar 1986. Contract AC03-76SF00098. 21p. (EEB-EPB—86-07; CONF-850606—17). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009896.

From American Society of Heating, Refrigerating and Air-Conditioning Engineers' semiannual meeting; Honolulu, HI, USA (23 Jun 1985).

Fan pressurization techniques are being employed by an increasingly large number of contractors and auditors to determine the leakage characteristics of structures. In this study, a large data base of flow exponents and flow coefficients is compiled to determine the degree of correlation that exists between flow parameters. The resulting empirical relationships are then used to determine the feasibility of predicting these flow parameters directly from a single pressure difference test. On the basis of these correlations, a new pressure independent tightness parameter is proposed.

30003 **(LBL—20348) Detailed thermal performance data on conventional and highly insulating window systems.** Arasteh, D.; Selkowitz, S.; Hartmann, J. (Lawrence Berkeley Lab., CA (USA)). Jan 1986. Contract AC03-76SF00098. 23p. (EEB-W—86-04; CONF-851202—11). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009947.

From DOE-ORNL-ASHRAE-BTECC conference on thermal performance of the exterior envelopes of buildings-III; Clearwater Beach, FL, USA (2 Dec 1985).

Data on window heat-transfer properties (U-value and shading coefficient [SC]) are usually presented only for a few window designs at specific environmental conditions. With the introduction of many new window glazing configurations (using low-emissivity coatings and gas fills) and the interest in their annual energy performance, it is important to understand the effects of window design parameters and environmental conditions on U and SC. This paper discusses the effects of outdoor temperature, wind speed, insolation, surface emittance, and gap width on the thermal performance of both conventional and highly insulating windows. Some of these data have been incorporated into the fenestration chapter of the "ASHRAE Handbook - 1985 Fundamentals." The heat-transfer properties of multiglazed insulating window designs are also presented. These window systems include those having (1) one or more low-emittance coatings; (2) low-conductivity gas-fill or evacuated cavities; (3) a layer of transparent silica aerogel, a highly insu-

lating microporous material; or (4) combinations of the above. Using the detailed building energy analysis program, DOE 2.1B, we show that these systems, which all maintain high solar transmittance, can add more useful thermal energy to a space than they lose, even in a northern climate. Thus, in terms of seasonal energy flows, these fenestration systems out-perform insulated walls or roofs.

30004 (LBL—20950) **Measured results of energy conservation retrofits in residential buildings.** Goldman, C.A. (Lawrence Berkeley Lab., CA (USA)). Jul 1985. Contract AC03-76SF00098. 25p. (CONF-860106—3). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009394.

From ASHRAE semi-annual meeting; San Francisco, CA, USA (19 Jan 1986).

This study summarizes measured data on energy savings from conservation retrofits in existing residential buildings to the building shell, principally insulation of exterior surfaces, window treatments, and infiltration-reduction measures, are the most popular, although data on various heating system retrofits are now available. The average retrofit investment per unit in multifamily buildings is approximately $700, far lower than the average of $1350 spent in single-family residences. Savings achieved are typically 20% to 30% of pre-retrofit space heating energy use, although large variations are observed both in energy savings and in costs per unit of energy saved. Particularly cost-effective retrofit strategies are identified based on measured energy use data. Predicted versus actual savings are also compared for groups of homes in 24 retrofit projects.

30005 (MRI/SOL—1901, pp 409-429) **Design of energy-responsive commercial buildings.** Ternoey, S.E. (S.E. Ternoey, Architects and Energy Consultants, Lakewood, CO). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The book Design of Energy-Responsive Commercial Buildings is a guide for architects and engineers who want to reduce the non-renewable energy needs of commercial and institutional buildings. The purpose, goals and derived approach for the book are discussed in detail. The contents of the book and the major innovations that it contains are also reviewed.

30006 (MRI/SOL—1901, pp 431-443) **Traditional methods for energy conservation in dwelling units.** Kilical, A.A. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Human beings, to perform their tasks and daily activities in an efficient way, have to spend a minimum amount of their bodily energy to adjust themselves to their climatic environment. Modern technology of the 20th century introduced electronic and mechanical devices to create an artificial comfort zone in living-working spaces. These devices, which depend almost entirely on fuel/electric energy, spread all over the world in a very short period of time. One of the reasons behind this extensive use of heating-cooling devices is the freedom they provide to designers. Although it is almost impossible to deny the support of modern technology in the heating-cooling of spaces to create a liable environment, a rational use of energy is also a must. Properly designed houses and housing settlements will need less assistance from these mechanical devices. The design of energy-efficient buildings is discussed.

30007 (MRI/SOL—1901, pp 445-467) **Efficient utilization of energy in the growth of existing campuses.** Farahat, A.M. (King Abdulaziz Univ., Jeddah, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Some approaches and solutions for accommodation of growth in existing campuses in both Saudi Arabia and the US are discussed. Approaches and solutions discussed demonstrate the efficient utilization of energy through achievement of a higher efficiency in the utilization of land, infrastructure, building resources, open spaces, and circulation and communication patterns. Solutions discussed also demonstrate energy efficiency through passive solar techniques such as greenhouses, earth-sheltered structures, protection from the sun in both buildings and open spaces, and the use of multi-effect glazing in the roofing of large interior-exterior spaces.

30008 (MRI/SOL—1901, pp 469-485) **Finite difference algorithm for the evaluation of the response factors of multilayer slabs for dynamic simulation of transient conduction heat flow.** Numan, M.Y. (King Faisal Univ., Dammam, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Complex and sophisticated dynamic thermal simulation models, used for accurate and detailed analysis of a building's thermal performance and energy demand, strive to utilize economical and accurate solution procedures for the evaluation of the relevant thermal transfer processes, a requisite for efficient computer application. The rigorous thermal analysis involved with such models requires formulation and solution of energy balance equations, for the relevant thermal transfer processes for various structural components, generally represented by temperature nodes. Techniques which reduce the number of nodal energy balance equations are of greater practical advantage. The practical application of the response factor for transient conduction heat flow simulations is discussed. The Hopscotch finite difference algorithm appropriate for the evaluation of the response factors is described. The efficiency and accuracy of the algorithm are illustrated by worked examples of response factors for a variety of composite slabs. These are shown to agree well with values obtained by the NBSLD program.

30009 (MRI/SOL—1901, pp 487-501) **Effect of wall geometry on net heat gain or loss.** El Diasty, R. (King Saud Univ., Riyadh, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Although there has been a great deal of interest in recent years in the study of the thermal performance of external walls, most of the attention has been directed towards the improvement of the thermal properties and the development of efficient thermal calculation procedures. On the other hand, little attention has been given to the effect of wall geometry on the net heat gain. An attempt was made to study the effect of the decision made by designers concerning the external wall geometry on the net heat gain. The work also includes: (1) a comparative analysis of typical geometries commonly used for external walls, (2) the impact of shading, orientation, and wall pattern on the net heat gain, and (3) recommendations and design guidelines for external wall geometry. Also further research in this area is discussed.

30010 (MRI/SOL—1901, pp 503-516) **Climate of Riyadh and the passive response in traditional buildings.** Ullah, M.B. (Univ. of Petroleum and Minerals, Dhahran, Saudi Arabia). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

The building in all its forms modifies the climate in some ways. This climate modifying aspect of buildings has always been recognized by architects and builders. Many researchers in architecture attempted to identify building characteristics appropriate for a climate. A method of describing the climate through time-averaged isopleth charts of dry bulb outdoor air temperature, relative humidity, wind speed and direction together with the solar radiation was found to be comprehensive enough for describing the climate of a place, and these isopleth charts were combined to develop the comfort chart for the place. In further research, it was found that another chart based on Beaufort scales for wind speed is very helpful in identifying the use of openings in buildings with respect to dust penetration. This chart is called the Beaufort chart. The preserved ruins of Dariyah in Riyadh offer an excellent opportunity for analyzing the characteristics of traditional buildings against the climate. Since it is easy to produce the solar chart using

the ASHRAE relation using extinction coefficient and diffuse radiation factor, the solar radiation chart is not given.

30011 (MRI/SOL—1901, pp 791-803) **Measures for energy conservation in buildings: Singapore experience.** Rao, K.R. (National Univ. of Singapore). 1984. NTIS, PC A99/MF A01. File Number DE86006385. (CONF-8405149—).

From SOLERAS workshop on solar buildings; Riyadh, Saudi Arabia (5 May 1984).

Large high rise commercial and office buildings are a common feature in all major cities of the world, including those of developing countries. These buildings are invariably air-conditioned and are highly energy intensive to operate. Significant energy savings can be achieved in such buildings if proper energy conservation measures are taken. A review of the Singapore experience in formulating and implementing regulatory control and other energy conservation measures in both new and existing buildings is presented.

30012 (NP—6751702) **Analyzing the applicability of black coal in public buildings of the Ruhr District.** (Kommunale Technologie-Beratung Ruhrgebiet G.m.b.H., Oberhausen (Germany, F.R.)). 1985. 74p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751702.

A Ruhr District analysis of the black coal potential use in public buildings has been carried out on behalf of the Nordrhein-Westfalen Department of Economics, Trade and Transportation. The study is based on a comprehensive survey of constructional data. An extrapolation of results has been applied to both the regional and federal level. Above analysis proves that generally the municipalities, inspite of the higher first cost, indeed profit by the application of black coal in merely installed heating systems. The fact that indigenous coal is the only positively available energy source should be considered another essential advantage. Coal price development is calculable over against the price development of petroleum and gas which, as they have to be imported, are energy sources whose availability (and prices) will always be subject to political influences. (orig./UA).

30013 (NP—6751718) **Thermal measurements in greenhouses attached to residential buildings. Climatic conditions - occupants - thermal comfort.** Eggenberger, A. (Bundesamt fuer Energiewirtschaft, Bern (Switzerland)). Jun 1985. 153p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE86751718.

In the course of IEA research programs thermal measurements were taken in greenhouses attached to residential buildings. Not only did they serve to determine the heat gain, but also to define whether or not greenhouses are habitable. Statements could also be made on the actual behaviour of greenhouse occupants and occupant-specific influences on thermal comfort, respectively. The paper abstracted gives a description of experimental set-up and tested objects. Measuring results are pointed out by way of tables or diagrams. (BWI).

30014 (NYSERDA—85-20) **Residential earth-coupled heat pump demonstration. Final report.** (Fleming (W.S.) and Associates, Inc., Syracuse, NY (USA)). Oct 1985. 290p. NYSERDA, Dept. of Communications, Two Rockefeller Plaza, Albany, NY 12223. File Number TI86901303.

The work in this report describes a field-test program for evaluating nine residential earth-coupled heat pump systems, located in upstate New York homes. Horizontal and vertical earth coils were used in conjunction with heat pumps of several different manufacturers to provide heating, air conditioning and domestic hot water at each of the sites. Results of the project found that earth-coupled heat pumps could significantly reduce the energy required for the heating and cooling functions, while providing a lower and more uniform electric demand. Also, the project report summarized the detailed performance and consumer economics of these systems. Recommendations were made to assess potential heat pump technology improvements and to develop mechanisms for earth-loop design and optimization to improve both operating performance and system economics.

30015 (ORNL/M—149) **Report brief. Category: evaluation and modeling.** Goeltz, R.; Hirst, E.; Trumble, D. (Oak Ridge National Lab., TN (USA)). May 1986. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009959.

Three brief reports are presented. The first being the Bonneville Power Administration (BPA) residential weatherization program; the second being electric utility demand-side programs and plans; and finally, the BPA conservation assessment and demand forecasting models. (BCS)

30016 (ORNL/Sub—84-97333/1) **Building materials research agenda.** (Massachusetts Inst. of Tech., Cambridge (USA)). Apr 1986. Contract AC05-84OR21400. 132p. NTIS, PC A07/MF A01; GPO Dep. File Number DE86010079.

An ad hoc panel of individuals was organized to proposed a research agenda, scope and objectives that the DOE/ORNL Building Materials Research Program should pursue. The panel recognized accomplishments and advances made over the past five years in selecting agenda projects. The panel composed an extensive list of candidate research projects and selected twenty-four as most significant. Each of the twenty-four projects was characterized by two page descriptions which detailed objectives, scope, problem significance, technical approach, and research products. The panel recommended that DOE/ORNL consider these projects for funding over the next three to five years.

30017 **combined cold compressor ejector helium refrigerator.** Brown, D. P. (to The United States of America as represented by the United States Department of Energy). US Patent 4,548,053. 22 Oct 1985. Filed date 5 Jun 1985. vp.

PAT-APPL-617656.

A refrigeration apparatus having an ejector operatively connected with a cold compressor to form a two-stage pumping system. This pumping system is used to lower the pressure, and thereby the temperature of a bath of boiling refrigerant (helium). The apparatus as thus arranged and operated has substantially improved operating efficiency when compared to other processes or arrangements for achieving a similar low pressure.

30018 **Absorption machine with desorber-resorber.** Biermann, W. J. (to The United States of America as represented by the United States Department of Energy). US Patent 4,546,620. 15 Oct 1985. Filed date 5 Nov 1984. vp.

PAT-APPL-668459.

An absorption refrigeration system utilizing a low temperature desorber and intermediate temperature resorber. The system operates at three temperatures and three pressures to increase the efficiency of the system and is capable of utilizing a lower generator temperature than previously used.

30019 **Strategy for accelerating the use of energy-conserving building technologies.** Brown, M.A.; Soderstrom, E.J.; Copenhaver, E.D.; Sorensen, J.H. (Oak Ridge National Lab., TN). *Journal of Technology Transfer;* **10**: No. 1, 35-50(Fal 1985).

To accelerate the use of energy-conserving building technologies in the far-flung, decentralized buildings industry, a strategy for more directed transfer of government research to public- and private-sector users has been implemented. The strategy involves a cycle of four sets of activities: (1) Needs assessment; (2) development of transferable information; (3) outreach activities; and (4) feedback and evaluation. By employing this iterative technology transfer cycle and emphasizing trade and professional organizations as communication channels to and from users, it is hoped that research sponsored by the US Department of Energy's Building Systems Division will be responsive to the industry's needs and accessible to its diverse participants. 33 references, 1 figure.

30020 **Analysis of energy conservation standards for Singapore office buildings.** Turiel, I.; Curtis, R.; Levine, M.D. (Lawrence Berkeley Lab., CA). *Energy (Oxford);* **10**: No. 1, 95-107(1985).

The authors have evaluated existing energy conservation standards for office buildings in Singapore and recommend changes

in the present lighting and OTTV (overall thermal transfer value) standards. The analysis shows that significant energy savings can be effected by the use of daylighting and several other measures that reduce cooling loads. It was found that some other measures (e.g. ceiling and wall insulation and double-glazed windows) have little impact on energy use. 6 references, 7 figures, 4 tables.

30021 **Thermophysical properties of industrial insulators.** McElroy, D.L.; Neuer, G.; Tye, R.P. (Oak Ridge National Lab., TN). *High Temperatures - High Pressures;* **16**: 109-114(1984).

From 8. European thermophysical properties conference; Baden, West Germany (27 Sep 1982).

The use of thermal insulation materials and systems for the so-called industrial and commercial insulating field (that is, all other than those for the building envelope) is most important in the total subject of energy conservation. While the total number of industrial and commercial installations requiring insulation is considerably less than the corresponding number of buildings, their size and magnitude, together with the much larger temperature differences involved give rise to heat losses, or gains, which are of the same total order. In addition, as buildings become energy efficient as a result of the current attention being paid to them, the need to turn attention towards the industrial and commercial areas grows. A limited assessment of industrial thermal insulation was prepared in the USA in 1976. Since 1976, a group of concerned workers representing all sectors, including government, manufacturers, users and general interest parties, working within ISO TC 163 Thermal Insulation Committee, have attempted to draw attention to the subject of industrial insulation. The present Workshop or forum is an attempt to reach a broader audience and to try to obtain some consensus on the definition and resolution of major problem areas, many of which relate directly to thermal properties and performance.

3202 Transportation

30022 **Machine for applying a two component resin to a roadway surface.** Huszagh, D. W. (to The United States of America as represented by the United States Department of Energy). US Patent 4,529,127. 16 Jul 1985. Filed date 25 Apr 1983. vp.

PAT-APPL-488306.

A portable machine for spraying two component resins onto a roadway, the machine having a pneumatic control system, including apparatus for purging the machine of mixed resin with air and then removing remaining resin with solvent. Interlocks prevent contamination of solvent and resin, and mixed resin can be purged in the event of a power failure.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 29480, 29988, 30124

30023 **(CONF-8502124—) Depositions of environmental pollutants.** (Technische Univ. Braunschweig (Germany, F.R.). Inst. fuer Grundbau und Bodenmechanik). 1985. 265p. (In German). NTIS (US Sales Only), PC A12/MF A01. File Number DE86751719.

From Technical seminar on pollutant deposition; Braunschweig, F.R. Germany (6 Feb 1985).

Waste disposal and waste recycling are given first priority in environmental policy. Pollutants can escape from dumps in gravitational water or in gaseous form. Leakage of water and gas must be prevented by constructional means, and biological, physical, or chemical processes must be developed for treating the gas and water. The complexity of the task requires interdisciplinary solutions developed in a joint effort by scientists, chemical engineers, and constructional engineers. (orig./EF).

30024 **(ETY—1/1982) Heat pumps for district heating of smaller cities.** Tuominen, A.; Salminen, H.; Tarjanne, R. (Finnish Energy Economy Association, Helsinki). 1982. 99p. (In Finnish). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751658.

The purpose of this basic study was to find out the technical and economic feasibility of heat pumps for district heating of smaller cities. The heating effect of heat pump units in this study has been some megawatts. Heat source for the studied system was low grade waste heat from industrial plants. Different factors affecting the connection of heat pumps have been examined according to conditions prevailing in a chosen example location. The cost structure for alternative systems have been determined for technical and economic analysis. The potential of heat pumps for district heating in Finland has been estimated based on the results of this study and studies on industrial waste heat. The best suitable machinery can be screw- or centrifugal-type compressor, with one to four circuits for temperature raise, depending on local conditions. The heat price developed with a four-circuit electric driven system has been calculated to be of the same level as with a heavy fuel-oil fired boiler. For compressor drive the best solution seems to be electric motor. For larger units, heavy fuel-oil fired diesel engine is competitive with electric drive. The results of the study are based on a rather high cost of energy for compressor drive, taking into account the unit size and base-energy characteristics of the proposed system. Parameters affecting strongly on the feasibility are the magnitude of investments for the equipment and the pricing of drive energy. The investments depend significantly on the conditions of waste water source and heat load and on the distance between them.

30025 **(ETY—2/1983) Improvement of the energy economy of industrial lightning.** Ollila, H.; Koski, P.; Boerman, B.; Ahponen, V. (Finnish Energy Economy Association, Helsinki). 1983. 133p. (In Finnish). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751659.

The aim of the research was to study the present state and special features of industrial lighting, and on the basis of this study, to give advice, design instructions and product development principles for economical industrial lighting. The main attention was focused on lighting of industrial production aras and storehouses. The state and special features of the industrial lighting were actually examined during a field study. The most common deficiencies and problems, the energy consumption of the lighting and the attitudes towards lighting were studied by lighting measurements, examining electrical designs, interviewing operating personnel and workers and by visual evaluation. In the field study 94 areas were examined. DIrt and the use of long-life lamps to over-aged levels proved to be the most important factors depreciating lighting levels. Even in relatively clean rooms the illuminances were allowed to decrease to one third, and even below, of the assumed values reached with new lamps. Energy savings of tens of percents can be achieved by increasing the efficiency of lighting maintenance and/or by using luminaires that will stay easily clean.

30026 **(ETY—5/1983) Vapour recompression evaporation of black liqour.** Jungerstam, B.; Laurola, H.; Oestman, H. (Finnish Energy Economy Association, Helsinki). 1983. 88p. (In Finnish). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751662.

The purpose of this study was to find out the most economic application of heat pump for black liquor evaporation. The application of the heat pump principle in evaporation is especially advantageous because the temperature range (over 100 deg C) is advantageous considering theoretical efficiency and the heat pump presses the steam used in evaporation directly, thus making additional circulating liquor unnecessary. The usual term for evaporation by heat pump is "mechanical vapour recompression" (MVR) or "vapour recompression evaporation" (VRE). Two practical examples were chosen: a new mill and an existing mill. The prerequisities for the profitability of VRE have been shown. The most important factor in applying VRE at a sulfate pulp mill is that the saved steam can be used. The profitability greatly depends on the fact, whether the use of own fuels or purchased fuels are substituted by the increased use of electrical power. In the case, where one of the two evaporation lines of an existing mill was changed to VRE, the respective pay-back period slightly exceeded 1.5 years. An additional advantage in this case was an 8% increase in the total capacity of both evaporation lines which had already been tuned up very thoroughly. The results of the study indicate that the profitability of VRE greatly depends on the specific conditions at each mill. VRE is, however, a very competitive alternative for mills which have warm water surplus and capacity problems in the evaporation and use a lot of purchased fuels.

30027 (ETY—7/1983) Possibilities of using sludge for energy purposes. Siitonen, H.; Henriks, L. (Finnish Energy Economy Association, Helsinki). 1983. 32p. (In Finnish). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751665.

The aim of this study has been to evaluate the amount of sludge produced in the wood-processing industry in Finland and the possibility of using it for energy purposes. The evaluation has been carried out for each factory separately. The amount of sludge at dumping grounds and in waterways has also been estimated as accurately as possible. According to an inquiry 16 factories use sludge as fuel in Finland at present. The combustion is, however, not always economical due to the low dry matter content of the sludge. The content of dry matter should be at least 35% and it is difficult to reach such a value with the dryers that at present are in operation. The drying equipment has lately been improved considerably and in a pilot test with sludge a dry substance content of 50% has been obtained. It is essential to be able to increase the content of dry matter to 50% if the use of sludge as fuel is to be economically justified. The combustion of sludge seems, according to present experience, to give few problems in a fluidized bed reactor. The costs vary, however, considerably depending on the content of dry substance of the sludge.

30028 (ETY—11/1984) Physical properties of spent liquor from chemical pulping processes. Salin, J.-G. (Finnish Energy Economy Association, Helsinki). 1984. 51p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751667.

The aim of this work has been to collect information from the literature about the physical properties of spent liquor from chemical pulping processes and to prepare a summary, based on this information, with the aid of which the calculation of a given physical property would be as easy as possible. The following physical properties have been dealt with: density, specific heat, boiling point elevation, freezing point depression, enthalpy, thermal conductivity, viscosity, Prandtl-number and calorific value. The dependence of a given property on different variables (type of spent liquor, dry solids content, temperature etc.) has been presented both graphically and in the form of analytical equations. Special attention has been paid to the choice of equation in order to have a form that is valid in as broad range as possible.

30029 (ETY—14/1985) Energy consumption variations in pulp and paper industry. Korpela, T.; Tarjanne, R.; Alamaeki. (Finnish Energy Economy Association, Helsinki). 1985. 121p. (In Finnish). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751669.

The aim of the study was to collect and analyze basic data on the energy consumption of Finnish pulp and paper industry. The data were obtained from reports and energy book keeping on the mills. Further measurements were carried out on two paper mills. The data collected were analyzed by statistical means. By regression analysis it was generated different models to explain energy consumption and its variation. DIfferent variables were used in the models, e.g. production volumes, temperatures and production daytimes. The models were commented and ranked according to their usefulness for energy consumption forecasting and management. The number of cases that were calculated within the study is over 70. Due to the differences in processes as well as in reporting the level of single analyzes was very different changing from energy balance of a paper machine to that of a whole integrated mill. As a result of the study several regression models were obtained by which the energy consumption of a functional unit can be forecasted. In some cases there was found strong unlinearity between energy consumption and production volume. The reasons for this unexpected phenomena must be found out before further conclusions.

30030 Director fired absorption machine flue gas recuperator. Reimann, R. C.; Root, R. A. (to The United States of America as represented by the United States Department of Energy). US Patent 4,548,048. 22 Oct 1985. Filed date 13 Nov 1984. vp.

PAT-APPL-670097.

A recuperator which recovers heat from a gas,generally the combustion gas of a direct-fired generator of an absorption machine. The recuperator includes a housing with liquid flowing therethrough, the liquid being in direct contact with the combustion gas for increasing the effectiveness of the heat transfer between the gas and the liquid.

30031 Process for removal of ammonia and acid gases from contaminated waters. King, C. J.; MacKenzie, P. D. (to The United States of America as represented by the United States Department of Energy). US Patent 4,547,293. 15 Oct 1985. Filed date 30 Aug 1984. vp.

PAT-APPL-645657.

Contaminating basic gases, i.e., ammonia, and acid gases, e.g., carbon dioxide, are removed from process waters or waste waters in a combined extraction and stripping process. Ammonia in the form of ammonium ion is extracted by an immiscible organic phase comprising a liquid cation exchange component, especially an organic phosphoric acid derivative, and preferably di-2-ethyl hexyl phosphoric acid, dissolved in an alkyl hydrocarbon, aryl hydrocarbon, higher alcohol, oxygenated hydrocarbon, halogenated hydrocarbon, and mixtures thereof. Concurrently, the acidic gaseous contaminants are stripped from the process or waste waters by stripping with steam, air, nitrogen, or the like. The liquid cation exchange component has the ammonia stripped therefrom by heating, and the component may be recycled to extract additional amounts of ammonia.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 29484, 29918, 30015, 30023, 30024

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

30032 (ESA-CR(P)—078) Liquid metal field emission thrusters and ion sources: a review. Final report. Prewett, P.D. (UKAEA Culham Lab., Abingdon). Jun 1983. 250p. NTIS, PC A11/MF A01.

The state of development and scientific understanding of liquid metal field emission propulsion systems is reviewed. Ion sources are also reviewed. The need for ion propulsion; the theory of ion emission from liquid metals under the action of high electric fields; and the elementary theory of hydrodynamic effects on surfaces subjected to electric stress are covered.

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 29224

30033 (LBL—18914) Induction period for ignition of fuel sprays at high temperatures and pressures. Parker, T.E.; Forsha, M.D.; Stewart, H.E.; Hom, K.; Sawyer, R.F.; Oppenheim, A.K. (Lawrence Berkeley Lab., CA (USA)). Jan 1985. Contract AC03-76SF00098. 14p. (CONF-850254—6). Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, PA 15096. File Number TI86009909.

From SAE international congress and exhibition; Detroit, MI, USA (27 Feb 1985).

Reported here are the results of an experimental study of the effect of preheating both the fuel as well as compressed air to supercritical temperatures for the fuel, performed with the use of pure n-dodecane. To direct as much attention as possible to the thermo-chemical phenomena, the experiment was carried out in a constant volume enclosure. Thus, unlike a rapid compression machine or an actual engine, the compressed air was at rest and uniform in temperature prior to fuel injection. The only turbulence affecting the process under study was that generated by the spray jet itself and, due to the simplicity of the apparatus, the temperature of the ignition environment was constant and precisely controlled.

30034 (N—86-14532) Investigation of chemically-reacting supersonic internal flows. Progress report. Chitsomboon, T.; Tiwari, S.N. (Old Dominion Univ., Norfolk, VA (USA)). Sep 1985. 45p. NTIS, PC A03/MF A01.

This report covers work done on the research project, Analysis and Computation of Internal Flow Field in a Scramjet Engine. The governing equations of two-dimensional chemically-reacting flows are presented together with the global two-step chemistry model. The finite-difference algorithm used is illustrated and the method of circumventing the stiffness is discussed. The computer program developed is used to solve two model problems of a premixed chemically-reacting flow. The results obtained are physically reasonable.

30035 **(N—86-16221) Simulating a small turboshaft engine in real-time multiprocessor simulator (RTMPS) environment.** Milner, E.J.; Arpasi, D.J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Jan 1986. 25p. (NASA-TM—87216; E—2876; CONF-860119—5). NTIS, PC A02/MF A01.

From Society for Computer Simulation (SCS) multiconference; San Diego, CA, USA (23 Jan 1986).

A Real-Time Multiprocessor Simulator (RTMPS) has been developed at NASA Lewis Research Center. The RTMPS uses parallel microprocessors to achieve computing speeds needed for real-time engine simulation. This report describes the use of the RTMPS system to simulate a small turboshaft engine. The process of programming the engine equations and distributing them over one, two, and four processors is discussed. Steady-state and transient results from the RTMPS simulation are compared with results from a main-frame-based simulation. Processor execution times and the associated execution time savings for the two and four processor cases are presented using actual data obtained from the RTMPS system. Included is a discussion of why the minimum achievable calculation time for the turboshaft engine model was attained using four processors. Finally, future enhancements to the RTMPS system are discussed including the development of a generalized partitioning algorithm to automatically distribute the system equations among the processors in optimum fashion.

30036 (N—86-17267, pp vp) **Numerical flow analysis for axial flow turbine.** Sato, T.; Aoki, S. 1984. NTIS, PC A14/MF A01. (NAL-SP—3; CONF-8407170—).

From 2. NAL symposium on aircraft computational aerodynamics; Tokyo, Japan (5 Jul 1984).

Some numerical flow analysis methods adopted in the gas turbine interactive design system, TDSYS, are described. In the TDSYS, a streamline curvature program for axisymmetric flows, quasi 3-D and fully 3-D time marching programs are used respectively for blade to blade flows and annular cascade flows. The streamline curvature method has some advantages in that it can include the effect of coolant mixing and choking flow conditions. Comparison of the experimental results with calculated results shows that the overall accuracy is determined more by the empirical correlations used for loss and deviation than by the numerical scheme. The time marching methods are the best choice for the analysis of turbine cascade flows because they can handle mixed subsonic-supersonic flows with automatic inclusion of shock waves in a single calculation. Some experimental results show that a time marching method can predict the airfoil surface Mach number distribution more accurately than a finite difference method. One weakpoint of the time marching methods is a long computer time; they usually require several times as much CPU time as other methods. But reductions in computer costs and improvements in numerical methods have made the quasi 3-D and fully 3-D time marching methods usable as design tools, and they are now used in TDSYS.

30037 **(TKK-KO/PM—41) Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines.** Turunen, R. (Helsinki Univ. of Technology, Otaniemi (Finland). Internal Combustion Engine Lab.). 1983. 269p. (In Finnish). NTIS (US Sales Only), PC A12/MF A01. File Number DE86751657.

At the beginning of the investigation, the properties of ethanol and methanol were examined on the basis of the literature, as were methods of using them as fuels in the diesel engine. Alcohols differ from the usual diesel fuel in their poor ignitability, low heat value, low air requirement and low viscosity. In order to ensure ignition they must be mixed with ignition improvers or the engine must be equipped with ignition aiding devices. In the experimental part, the practical properties of alcohol mixtures containing one ignition improver (octyl nitrate) in a high speed and in a medium speed diesel engine (Valmet 311 CS and Waertsilae 324 TS) have been investigated. The percentage of ignition improver needed was in the ethanol mixture ca. 17 weight percent and in the methanol mixture (on the basis of Valmet experiments) ca. 14 weight percent. Although the fuel injection devices of the experimental engines were not optimized for alcohol use, almost the same total efficiency was achieved with alcohol as with ordinary diesel fuel. Further, smoke values were observed to be negligible in alcohol use, heat stresses of pistons and wear of certain engine parts greater than normal.

30038 **(TKK-KO/PM—44) Endurance test of a high speed diesel engine using ethanol fuel.** Laurikko, J.; Pitkaenen, J. (Helsinki Univ. of Technology, Otaniemi (Finland). Internal Combustion Engine Lab.). 1984. 139p. (In Finnish). NTIS (US Sales Only), MF A01. File Number DE86751655.

This report describes the results of a long-term test carried out on a high-speed diesel engine using alcohol fuel. Wear, fouling, carbonizing and faults in lubrication belong to the problems of long-term use. These were studied in the experimental part on a 500 hour dynamometer test with variable load under laboratory conditions. The engine performance and its variations were also examined. VALMET 311 D6S diesel engine with direct injection was used as a test engine. It is a common power source for farm tractors and engine powered equipments. Ethanol was used as fuel with 17% ignition improving additive (octyl nitrate). In order to ensure the lubrication of the fuel injection equipments 1% castor oil was added into the fuel. Observing the wear was done by monitoring changes in the dimensions and masses of the parts. Fouling and carbonizing was examined was examined by means of visual inspection and photographs. A microscope was used when necessary. The engine was dismantled for inspection and measurement before the test, after 250 running hours and after the whole test was finished. Fuel injection equipments (fuel pump and nozzle) suffered most from alcohol fuel. Two alternatives for the injection nozzle in addition to the standard nozzle were tested, but hte standard nozzle was found superior according to the operation, service life and engine performance.

30039 **(TKK-KO/PM—45) Practical properties of ethanol used as a fuel in diesel engine supercharged in different ways.** Kivijaervi, J. (Helsinki Univ. of Technology, Otaniemi (Finland). Internal Combustion Engine Lab.). 1984. 145p. (In Finnish). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751656.

This report describes the practical properties of ethanol mixtures containing one ignition improver (octyl nitrate) when the alcohol is used as a fuel in a high speed direct injection diesel engine supercharged in different ways. Diesel oil was used as a reference fuel and as supercharging methods were turbocharging, comprexcharging and combined supercharging tested.

30040 **(TKK-KO/PM—46) Exhaust gas analysis of a diesel engine using alcohol as a fuel.** Turunen, R. (Helsinki Univ. of Technology, Otaniemi (Finland). Internal Combustion Engine Lab.). 1985. 43p. (In Finnish). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751654.

This report describes the exhaust emission test equipment used in Helsinki University of Technology at the Laboratory of Internal Combustion. The test equipment consists of CO_2- and O_2-analyzers and the analysis systems for CH-, NOsub(x)- and CO-emissions. The equipment is intended for measurements in diesel engines and it is to agreat extend construated according to the new ECE 49 regulation proposal.

30041 **(TKK-KO/PM—47) Alcohol as a fuel in a high speed diesel engine with double injection system.** Laurikko, J.; Pitkaenen, J. (Helsinki Univ. of Technology, Otaniemi (Finland). Internal Combustion Engine Lab.). 1985. 133p. (In Finnish). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751653.

This report describes the results of tests carried out on a diesel engine equipped with two separate fuel injection systems and using alcohol as main fuel. There is possibility of using pure alcohol as min fuel in a diese engine equipped with two fuel injection systems where ordinary diesel oil is used as ignition fuel. The advantages of this method are the large proportion of alcohol in the total amount of fuel and the possibility of using pure alcohol without the expensive ignition improving additive. The drawback is the high cost due to the complicated construction of the system, which is partly compensated by the cheaper fuel. The operation of a diesel engine with double injection systems is studied and the main parameters that control the combustion are examined by the information of similar tests given in the literature. The test results showed that from the parameters controlling the combustion the type of the auxiliary nozzle (ie. the direction of the ignition fuel spray) had the strongest effect on engine performance. The B-type nozzle with fuel spray directed across the swirl in the combustion chamber gave better performance than the A-type, where ignition fuel was injected to the direction of the swirl. The B-type nozzle gave also better distribution and mixing of the ignition fuel, therefore the ignition lag of the main fuel was shorter and the brake thermal efficiency slightly better than with the A-type nozzle.

30042 **(TKK-KO/PM—49) Cold-start tests with speed diesel engines using alcohol as main fuel.** Laurikko, J.; Pitkaenen, J. (Helsinki Univ. of Technology, Otaniemi (Finland). Internal Combustion Engine Lab.). 1985. 72p. (In Finnish). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751651.

This report describes the cold-startability of alcohol powered diesel engines and the results of tests carried out on two test engines based on different application methods. In cold-start tests carried out under laboratory conditions two direct injection alcohol powered diesel engines based on different application methods were evaluated. On the other engine alcohol mixture with ignition improving additive was used as main fuel and the other was equipped with two separate fuel systems using pure alcohol as main fuel and ordinary diesel oil as ignition fuel. The aim was to determine the temperature limit of cold-startability and find the methods and devices which guarantee adequate startability. Test were made within the temperature range of +20 deg C to -30 deg C and during the start-up the engine speed, cylinder pressure, intake air and exhaust gas temperatures plus needle lift of fuel injectors in the dual-fuel engine were recorded in addition to the test conditions. In the tests the startability of the alcohol mixture engine was found superior to the dual-fuel engine. The startability of the mixture-fuel engine was satisfactory until -15 deg C without any auxiliary devices but with the dual-fuel engine intake air preheating was necessary already at 0 deg C. Using intake air preheating both engines could be started at -30 deg C, but judging the test results the actual temperature limit cannot be much lower.

30043 **The knock syndrome - its cures and its victims.** Oppenheim, A.K. Warrendale, PA; Society of Automotive Engineers, Inc. (1984). 10p. (SAE-TP—841339). Contract AC03-76SF00098.

The problem of knock is traced back to the earliest scientific paper on combustion in premixed gases written by Mallard and Le Chatelier. The pioneering contributions of Ricardo, Kettering and Semenov are then put in proper perspective. Upon the recognition of the fact that this phenomenon has been, and still is, imposing the major technological constraint upon the automotive and oil industries, its various cures are reviewed. Essential features of combustion instability leading to its onset are then exposed, and the methodology is outlined for a rational attack upon the problem it poses.

30044 **Patterns of vehicle misfueling in 1981 and 1982: where, when, what vehicles, and how often?.** McNutt, B.D.; Elliott, D.; Dulla, R. Warrendale, PA; Society of Automotive Engineers, Inc. (1984). 12p. (SAE-TP—841345).

Based on nationwide gasoline diary records of 5,000 families, an analysis was conducted of automobile misfueling (use of leaded gasoline in a vehicle designed for unleaded gasoline) trends in 1981 and 1982. The gasoline diary data base and the data handling and analysis techniques are described. Overall trends in vehicle misfueling are given, focusing on 1982 data, followed by more detailed information on the location and frequency of misfueling.

30045 **Advanced adiabatic diesel engine for passenger cars.** Sekar, R.R.; Kamo, R.; Wood, J.C. Warrendale, PA; Society of Automotive Engineers, Inc. (1984). 14p. (SAE-TP—840434).

This paper presents the results of an analytical study to identify the essential features of a futuristic engine for cars. A combination of several advanced features in one engine package results in a dramatic increase in the fuel economy of the car while maintaining all other essential features at levels comparable to current cars on the market. This advanced adiabatic diesel engine is expected to give 78.8 mpg in the federal combined driving cycle in a 3,000-pound vehicle. This compares to 37.7 mpg and 30.0 mpg obtained in current diesel and gasoline engine powered cars, respectively. The study identified the research and development efforts needed to bring this concept to fruition and concluded that an aggressive 10-year program will result in production availability of these cars.

30046 **The effect of alcohol fueling on diesel engine durability.** Likos, W.E. Warrendale, PA; Society of Automotive Engineers, Inc. (1984). 6p. (SAE-TP—841384). Contract AC19-81BC10467.

The results of methanol fumigation on the performance and durability of three diesel engines are presented. The engines ranged in horsepower from 130 to 185, two of which were turbocharged. Both pre-chamber and direct-injected-type engines were represented. Methanol was sprayed into the intake manifold at a rate equal to 25 percent by volume of the total fuel flow. The engines ran at various speeds and loads following a cycle suggested by the ema for a total of 500 hours. No engine modifications were made to optimize performance on alcohol fuel. Performance testing for power and emissions and oil analysis for wear metals have not shown any significant wear due to the methanol fumigation. It has been concluded that alcohol fumigation performed under the stated test conditions does not induce wear or durability penalties.

30047 **Technological advances in vehicle design: Ford energy report.** Dorgham, M.A. (ed.). St. Helier, England; Inderscience Enterprise Ltd. (1982). 183p. Inderscience Enterprises Ltd., La Motte Chambers, St. Helier, Jersey, Channel Island, England.

Thirty papers were presented at the conference. A separate abstract was prepared for each paper for the Energy Data Base.

3302 External Combustion Engines

REFER ALSO TO CITATION(S) 30091

30048 **(CONF-860676—1) Stirling machines: adiabatic to isothermal.** West, C.D. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 19p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86005407.

From 3. international stirling engine conference; Rome, Italy (1 Jun 1986).

In most real Stirling engines the gas behavior in the cylinder is almost adiabatic, in contrast to the ideal Stirling engine in which all processes are isothermal. The combination of nearly adiabatic cylinders and nearly isothermal heat exchangers found in most Stirling engines leads to irreversibilities and loss of efficiency. Still worse, in many cases, is the performance of cylinders with a finite heat transfer intermediate between a near-adiabatic and near-isothermal behavior. Because of this behavior and because of the low thermal diffusivity of high-pressure gases, there is little hope of sufficiently enhancing the heat transfer within the cylinder of a conventional Stirling engine to increase the efficiency - in most cases, a decrease is more likely to result.

30049 **(DOE/NASA—0351-1) Experimental assessment of advanced Stirling component concepts.** Ziph, B. (Stirling Thermal Motors, Inc., Ann Arbor, MI (USA)). Oct 1985. Contract AI01-77CS51040. 104p. (NASA-CR—174994). NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86009863.

This final report presents the results of an experimental assessment of some advanced Stirling engine component concepts.

Under this program, high performance piston rings, reciprocating oil scrapers and heat pipes with getters and with mechanical couplings were tested. The tests yielded the following results: (1) Bonded, split, pumping piston rings, in preliminary testing, proved a promising concept, exhibiting low leakage and friction losses. Solid piston rings proved impractical in view of their sensitivity to the operating temperature. (2) A babbit oil scraper in a compliant housing performed well in atmospheric endurance testing. In pressurized tests the scraper did not perform well as a containment seal. The latter tests suggest modifications which may adapt Ti successfully to that application. (3) Heat pipe endurance tests indicated the adequacy of simple, inexpensive fabrication and filling procedures. Getters were proved to increase the tolerance of the heat pipes to the presence of air, and commercially available couplings were demonstrated to be suitable for heat pipe application. In addition to the above tests, the program also included a design effort for a split shaft applicable to a swashplate driven engine with a pressurized crankcase. The design is aimed, and does accomplish, an increase in component life to more than 10,000 h.

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 29879, 29881, 29884, 29885

30050 (CONF-8509154—Summs., pp 34-36) **Requirements for EV-batteries and consequences for test procedures.** von Courbiere, R.; Mueller, H.G. (GES Gesellschaft fuer elektrischen Strassenver-kehr mbH, Essen, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Safety on the road and a sufficient driving comfort require internal combustion engine equivalent power for EV's. Depending on the battery condition, the power of an EV is limited by the motor as well as by the battery. The battery manufacturers are asked to provide information concerning the dynamic behavior of the batteries and to prove this by type tests. It is not possible to fulfill the requirements laid down in one step. For further standardization, it would be acceptable to allow a power drop of 10% between beginning and end of the range. It also would be acceptable to apply current profiles instead of power profiles in order to simplify the discharge equipment when ensured, that equivalent results can be obtained. In any case the customary data does not provide enough information, which is valid for EV application.

30051 (CONF-8509154—Summs., pp 51-56) **Rationale and methodology for group testing of electric vehicle batteries.** Hardin, J.E.; Hunt, G.L.; Dowgiallo, E.J.; Burke, A.F. (Idaho National Engineering Lab., Idaho Falls). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Testing batteries in both the laboratory and in vehicles is an important part of evaluating new batteries and electric drivelines for electric vehicles. In the development of a new battery design, tests are made of cells, modules, and packs. The initial tests are made using cells and later, modules consisting of a number of cells are tested. Finally a number of modules in a pack are tested in a vehicle. In all cases the tests should be made in such a way that the results are meaningful for realistically assessing the use of the new battery in an electric vehicle application (i.e., particular vehicle design and use-pattern).

30052 (CONF-8509154—Summs., pp 64-67) **Test and data reduction algorithm for the evaluation of lead-acid battery packs.** Nowak, D. (Univ. of Alabama, Huntsville). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Experience from the DOE Electric Vehicle Demonstration Project indicated severe battery problems associated with driving electric cars in temperature extremes. The vehicle batteries suffered from a high module failure rate, reduced capacity and low efficiency. To assess the nature and the extent of the battery problems encountered at various operating temperatures, a test program was established at the University of Alabama in Huntsville (UAH). A test facility was built that is based on Propel cycling equipment, the Hewlett Packard 3497A Data Acquisition System and the HP85F and HP87 computers. The objective was to establish a cost effective facility that could generate the engineering data base needed for the development of thermal management systems, destratification systems, central watering systems and proper charge algorithms. It was hoped that the development and implementation of these systems by EV manufacturers and fleet operators of EV's would eliminate the most pressing problems that occurred in the DOE EV Demonstration Project. The data reduction algorithm is described.

30053 (CONF-8509154—Summs., pp 82-86) **Performance testing of advanced lead-acid batteries for electric vehicles.** Mahato, B.K.; Brilmyer, G.H.; Bullock, K.R. (Johnson Controls, Inc., Milwaukee, WI). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The program established by the US DOE through Argonne National Laboratory for development of lead-acid batteries for electric vehicles consisted of two phases. The first phase was a 3-year effort to develop an Improved State of the Art (ISOA) electric vehicle battery. In the second phase of the program, the goals for an advanced lead-acid battery were established. The performance testing of one advanced battery design developed by Johnson Controls, Inc., which was designed to meet the 1983 goals is discussed.

30054 (CONF-8509154—Summs., pp 113-114) **Accelerated life testing of sodium-sulfur cells.** Lehnert, G. (Brown, Boveri & Cie, Abt. EA, Heidelberg, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Currently, there is great interest in the development of the sodium-sulfur battery for Electric Vehicle (E.V.) and load leveling applications in many countries. One of the most critical steps of such developments is the achievement of a sufficient life and also the experimental verification of this value. For a E.V. battery the goal for life is greater than 1000 cycles, therefore, a real application testing would last several years. For this reason the need of accelerated life testing of batteries for this application is out of question. For some battery systems especially for lead-acid batteries some accelerated testing procedures were found, but these depend on the special degradation mechanisms of the investigated batteries and cannot be generalized. The aim of this work was the investigation of the behavior of sodium sulfur (Na/S) cells at accelerated test conditions and out of this the selection of proper procedures, that cause high time acceleration without changing the dominant mechanisms of degradation.

30055 (CONF-8509154—Summs., pp 132-134) **Innovative on-board instrumentation for EV battery characterization.** Dowgiallo, E.J. Jr. (Dept. of Energy, Washington, DC). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The purpose of this work was to: characterize EV performance with emphasis on the battery. This is necessary due to lead-acid traction battery limitations, and compress and store data unique to EVs as acquired both under test track conditions and during actual on-road operation. A description of the system is presented.

30056 (CONF-8509154—Summs., pp 140-141) **Design of the thermal management systems for NaS-traction-batteries by using battery models.** Eck, G. (Brown, Boveri & Cie Aktiengesellschaft, Heidelberg, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

NaS-batteries have an operating temperature between 300°C and 370°C. Therefore, the thermal management system (TMS) must

be able to heat the battery to those temperatures and to maintain an even temperature profile under all operating conditions. The maximum temperature differences within the cell matrix should not exceed 25°K horizontally and 20°K vertically. The TMS of B06 and B11 type NaS-batteries consist of a vacuum insulation battery box, electrical heater plates, a direct cooling system and related electronic control systems. The thermal management system is described.

30057 (CONF-8509154—Summs., pp 148-152) **Design, electric vehicle simulation program and duty cycle for a computer controlled bench test of lead-acid batteries.** Wagner, D.I.U. (Technical Univ. of Munich, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Testing of traction batteries should not be performed in accordance to existing duty cycles for vehicles with combustion engines. It ought to be a test procedure that is adapted to the mode of operation of electric vehicles (EV). Such a duty cycle is derived by way of analyzing the power profiles of an EV in urban traffic, which probably will be the main operational area for EV's. The most important criteria to be considered when establishing a duty cycle are pointed out. The next step would be a generalization of the established test cycle, which can be achieved by various methods.

30058 (CONF-8509154—Summs., pp 154-158) **Examination of battery-related electric vehicle track and field measurements.** Dowgiallo, E.J.; Kevala, R.J. (Dept. of Energy, Washington, DC). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

The US Department of Energy Electric and Hybrid Vehicle Program activities include on-the-road evaluation of electric vehicles (EVs) by site operators at several locations throughout the US. Daily vehicle operation and maintenance logs and energy input data are recorded by these site operators, which provide useful operating information about the EV fleet of more than 500 vehicles. However, in evaluating improved products and components or in assessing the capabilities of vehicles equipped with different batteries, more detailed engineering data are required. To acquire the needed data and to better understand the differences in performance observed under field and laboratory conditions, an onboard instrumentation system is essential. Such a system is discussed.

30059 (CONF-8509154—Summs., pp 160-165) **Validity of cycle life bench test data in relation to real world in-vehicle testing.** Klein, F.H. (GES Gesellschaft fuer elektrischen Strassenver-kehr, Essen, West Germany). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

When operated in EV's, traction batteries are required to deliver a maximum of energy- and power density. In addition, the conditions of operation can very significantly. This is specially true for personal cars. The categories of operating conditions are driving-, charging-, maintenance- and climatic conditions. The impact of single parameters on battery life from field test results is discussed. If the vehicle fleet is not too small, good information on battery life can be obtained when affected by all parameters.

30060 (CONF-8509154—Summs., pp 177) **Comparison of laboratory, dynamometer and road tests of an EV.** Loponen, M. (Neste Oy, Research Centre, Kulloo, Finland). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

Two prototype EV's have been constructed by a group of Finnish companies. The total weight of the vehicles is 1500 kg, of which 414 kg is due to the batteries. The motor has a maximum continuous power of 20 kW/1500 rpm and maximum peak power of 27 kW/1500 rpm for 15 minutes. The lead-acid batteries are of pasted plate type with low-antimony grids. The battery pack consists of 19 12V units. These are located in two thermally isolated boxes, one in the front and in the rear of the car. Road and dynamometer testing of the vehicles are discussed.

30061 (CONF-8509154—Summs., pp 179-184) **Simple methodology for obtaining battery discharge times (and vehicle ranges) for arbitrarily structured load profiles.** Hornstra, F. (Argonne National Lab., IL). Sep 1985. NTIS, PC A09/MF A01. File Number DE86001615.

From International battery testing workshop; Heidelberg, F.R. Germany (29 Sep 1985).

At the National Battery Test Laboratory (NBTL) at Argonne National Laboratory (ANL), an easily applied methodology has been developed, that allows battery discharge times (and vehicle ranges) to be approximated for arbitrarily structured profiles of battery discharge. The methodology uses a Ragone plot (Wh/kg versus W/kg plot) and a peak power versus depth of discharge (DOD) plot. Both plots, which are relatively simple, are obtained in the standard test program at the NBTL. The only knowledge required of the application load profile is the peak and average specific power demands on the battery; the detailed structure of the load profile is not essential. The use of this methodology provides several benefits over direct application of a power profile to the battery. This methodology is illustrated by three examples involving simulated profile discharges of batteries. Other supporting data are also presented.

30062 (NP—6751711) **Investigations of three-phase current drives for electric battery cars. Vol. 1. Fundamental principles, system studies and results of experimental studies.** Skudelny, H.C.; Gratzfeld, P.; Naydowski, C.O.; Fuchs, F.W. (Technische Hochschule Aachen (Germany, F.R.). Lehrstuhl und Inst. fuer Stromrichtertechnik und Elektrische Antriebe). Dec 1983. 240p. (In German). NTIS (US Sales Only), PC A11/MF A01. File Number DE86751711.

Extensive and detailed description of the development of electric cars in the most important industrial countries (USA, Japan, Europe) followed by a description of requirements for electro-cars (traction-speed diagram, performance adaptation, reach, energy consumption), and the state of technology (standard solutions, simple versions, advanced developments). Various types of three-phase current drives are described in detail, distinguishing between voltage- and current operated dc-ac converters; one also deals with realised converter connections, drive with induction motor; permanently excited synchronous motor and reluctance motor. Measurement values gained with three-phase current drives are given: experience with operations on test stands and in vehicles; voltage- and current flow in the drive components; drive with d-c intermediate circuit. Information is presented on experimental determination of drive losses and -efficiency. The drives that were studied are compared. (HWJ).

30063 (NP—6751713) **Investigations of three-phase current drives for electric battery cars. Vol. 2. Simulation; theory and results.** Fuchs, F.W.; Bendien, J.C.; Naydowski, C.O. (Technische Hochschule Aachen (Germany, F.R.). Lehrstuhl und Inst. fuer Stromrichtertechnik und Elektrische Antriebe). Dec 1982. 192p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751713.

Detailed report about simulation programs for electric battery vehicles with threephase current drives. Use of the programmes is demonstrated by means of model calculations. Before constructing a drive, parameters can be varied by simulation until optimation is reached. The state of technology of simulation is described, three simulation methods are introduced. The first method only uses direct-current parameters and the fundamental mode of alternating parameters. Results of operational behaviour of the drive and its components are gained. In the second method differential equations for a simplified drive model are solved in the time range. This allows to calculate time curves. The third method uses simulation in the frequency range and allows to calculate time curves as well as losses. A simple integration of frequency-dependent properties of components (Fourier-transformation) is made possible. Calculation results of these three simulation methods were finally checked by comparing them to measurements made in the laboratory. (HWJ).

30064 **Technological advances in vehicle design: electric and hybrid vehicles.** Dorgham, M.A. (ed.). St. Helier, England; Inderscience Enterprise Ltd. (1982). 179p. Inderscience Enterprises Ltd., La Motte Chambers, St. Helier, Jersey, Channel Island, England.

Twelve papers were presented at the conference. A separate abstract was prepared for each paper for the Energy Data Base.

30065 **Computer-aided design of electric and hybrid vehicles.** Burke, A.F.; Somuah, C.B. (General Electric Co., Schenectady, NY). pp 61-81 of Technological advances in vehicle design: electric and hybrid vehicles. Dorgham, M.A. (ed.). St. Helier, England; Inderscience Enterprise Ltd. (1982). Contract AC03-76CS51294.

A number of computer programs have been developed as tools in the evaluation and design of electric and hybrid vehicles. The programs are concerned with vehicle use-pattern characterization, design synthesis, vehicle operation over driving cycles, and transient response of electric/hybrid power trains. Each of the programs is described in some detail and typical results obtained using the programs are discussed in terms of the performance of the General Electric/DOE Near-Term Electric and Hybrid Vehicles. Projections of the performance of advanced electric/hybrid vehicles are also presented based on the computer simulations.

30066 **Rebirth of the lead-acid battery - meeting the electric vehicle challenges of the 1980s.** Mrotek, E.N.; Gurlusky, P.J. (Johnson Controls, Inc., Milwaukee, WI). pp 116-124 of Technological advances in vehicle design: electric and hybrid vehicles. Dorgham, M.A. (ed.). St. Helier, England; Inderscience Enterprise Ltd. (1982). Contract W-31-109-ENG-38.

Lead-acid battery development has over one hundred years of previous technology to draw upon. This technology, coupled with new, unique innovations, all orientated towards electric vehicle battery applications, will be discussed. Foremost among these is an acid circulation system with its proven ability to increase cycle life and enhance charging efficiencies by maintaining electrolyte homogeneity. A description is given of a semi-automatic watering and venting system, both necessary for the proper, efficient, and safe maintenance, of a high-voltage battery pack located in the heart of the electric vehicle. The inclusion of a patented and proven flame arrestor within the venting arrangement adds to the uniqueness of the system. The need to design a charging system as an integral component of the entire energy package is highly stressed. The absolute necessity to understand the chemical components within the lead-acid system has stimulated the development of new, analytical screening techniques. Several screening methods are covered. The limiting factors in the lead-acid equation are few and conquerable. We must, however, begin to view it now as a viable energy source for today's needs and those of the future.

30067 **Generic battery model for electric and hybrid vehicle simulation performance prediction.** Chapman, P.; Aston, M. (Jet Propulsion Lab., Pasadena, CA). pp 125-143 of Technological advances in vehicle design: electric and hybrid vehicles. Dorgham, M.A. (ed.). St. Helier, England; Inderscience Enterprise Ltd. (1982).

The importance of battery models for predicting electric and hybrid vehicle (EHV) performance is discussed. The term generic is then described as it pertains to battery models and computer simulation. A barrery polynomial equation is formulated that provides the main hypothesis for several generic battery models. Temperature compensation is factored into the polynomial and the baseline Fractional Utilization Battery Model is explained. The JPL/Purdue Model, which is being used in the US DOE funded ELVEC EHV Computer Simulation Program is discussed. This model is a generic modification of an algorithm developed at Purdue University by H.L. Martin. The relationship between this model and the Fractional Utilization Model is illustrated, and the accuracy of the model is compared to actual vehicle and laboratory tests.

30068 **Systems approach to the aerodynamic design of electric and hybrid vehicles.** Kurtz, D.W. (Jet Propulsion Lab., Pasadena, CA). pp 144-153 of Technological advances in vehicle design: electric and hybrid vehicles. Dorgham, M.A. (ed.). St. Helier, England; Inderscience Enterprise Ltd. (1982).

A typical subcompact EHV, driving an SAE J227a D urban cycle, consumes around 35% of its road energy requirement overcoming aerodynamic resistance. The application of an integrated system design approach, where aerodynamic drag reduction is an important design parameter, can increase the cycle range by over 15%. This article is an abridgement of an aerodynamic design guidebook developed for electric and hybrid vehicles under the US Department of Energy's Electric and Hybrid Vehicle Program. The basic structure is a logic strategy for pursuing aerodynamic drag reduction to a degree appropriate to the mission requirements. Elements of the procedure are based on extensive wind tunnel tests involving generic subscale models and full-scale production and prototype vehicles. The intended user is the vehicle designer and builder who has little or no aerodynamic background. By necessity, the procedure uses many generic approximations and assumptions resulting in various levels of uncertainty. Dealing with these uncertainties, however, is a key feature of the strategy.

3304 Hybrid Systems

REFER ALSO TO CITATION(S) 30064, 30065

3306 Vehicle Design Factors

REFER ALSO TO CITATION(S) 30047

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 29224, 30037, 30038, 30039, 30040, 30041, 30042, 30044, 30046

30069 **(DOE/CE/50036—H1) Research and development of alcohol fuel useage in spark-ignited engines.** Pefley, R.K.; Browning, L.H. (Santa Clara Univ., CA (USA)). Apr 1986. Contract FG03-84CE50036. 66p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009881.

This report is a concluding document of a one year investigation of methanol fuel utilization in spark ignited engines. The cold starting study of methanol occupies a dominant portion of this report. It contains three phases: (1) computer modeling wherein the effects of fuel concentration, droplet size, electric heating and use of reformed methanol are evaluated as functions of ambient temperature; (2) experimental cold chamber studies which are parametrically allied to the modeling studies and wherein a piezo-electric device is used to generate fuel droplets in the 10 micron range; (3) vehicle studies relating to starting vehicles on alcohol fuels using state-of-the-art fuel systems and fuel blending agents. The study during this time period has focused on three-way catalyst efficiency and vehicle performance with elevated engine compression ratio (12:1). It is found that by minor adjustments the catalyst efficiency can be as good on alcohol as gasoline, whereas without these adjustments, the vehicle exhaust NO/sub x/ is elevated when using methanol fuel even though the "engine out" NO/sub x/ is, as expected, lower than gasoline.

36 MATERIALS

REFER ALSO TO CITATION(S) 29152, 29428, 30175

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 29167, 29316, 29420, 29639, 29750, 29751, 29751, 29752, 29752, 29754, 29754, 29765, 29765, 29777, 29777, 29786, 29796, 29838, 29857, 29857, 29859, 29859, 30124, 31034, 31034, 31035, 31035, 31036, 31036, 31036, 31037, 31038, 31039, 31040, 31041, 31042, 31043, 31044, 31045, 31046, 31047, 31048, 31049, 31050, 31051, 31052, 31053, 31053, 31054, 31055, 31056, 31057, 31058, 31058, 31059, 31059, 31060, 31060, 31061, 31062, 31063, 31064, 31065, 31066, 31066, 31075

30070 (AECL—7813) Verification tests of a high-temperature transverse creep model for Zr-2.5 wt % Nb pressure tubes. Shewfelt, R.W.S.; Godin, D.P.; Lyall, L.W. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Feb 1984. 45p. NTIS (US Sales Only), PC A03/MF A01. File Number DE84901010.

Work performed under Canada/US Waste Management Information Exchange Agreement.

Transverse creep equations have been developed, from uniaxial creep tests at essentially constant temperature, to predict the ballooning of Zr-2.5 wt % Nb pressure tubes during a hypothetical loss-of-coolant accident in a CANDU reactor. Numerous biaxial creep tests were done in which the temperature of internally pressurized sections of pressure tube was ramped to check the ability of these equations to predict the transverse creep strain under biaxial stress conditions with varying temperature. As the biaxial tests could not cover the complete range of temperature ramp rates that might occur during a loss-of-coolant accident, uniaxial creep tests were also done with ramp rates from 1°C/s to 50°C/s and transverse stresses from 5 MPa to 130 MPa. The equations were successful in predicting the transverse creep strains observed in all the biaxial and uniaxial creep tests.

30071 (AECL—8365) Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel. Mathew, P.M.; Taylor, M.; Krueger, P.A. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Feb 1985. 42p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900454.

Work performed under Canada/US Waste Management Information Exchange Agreement.

In the Canadian Nuclear Fuel Waste Management Program, metal matrices with low melting points are being evaluated for their potential to provide support for the shell of disposal containers for used fuel, and to act as an additional barrier to the release of radionuclides. The metal matrix would be incorporated into the container by casting. To study the heat transfer processes during solidification, a steady-state technique was used, involving lead as the cast metal, to determine the overall heat transfer coefficient between the lead and some of the candidate container materials. The existence of an air gap between the cast lead and the container material appeared to control the overall heat transfer coefficient. The experimental observations indicated that the surface topography of the container material influences the heat transfer and that a smoother surface results in greater heat transfer than a rough surface. The experimental results also showed an increasing heat transfer coefficient with increasing temperature difference across the container base plates; a model developed for base-plate bending can explain the observed results. 8 refs., 12 figs., 3 tabs.

30072 (CEA-CONF—8100) Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation. Alamo, A.; Aubert, H.; Laniesse, J.; Lelong, C.; Pigoury, M.; Foucher, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Aug 1985. 6p. (In French). (CONF-850823—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751336.

From 7. international conference on the strength of metals and alloys; Montreal, Canada (12 Aug 1985).

Transformation of ferrite into austenite and of austenite into martensite, precipitation of intermetallic phases and tensile properties of the steel Cr13-Mo1.5 are studied in function of Ti additions (from 0 to 3%) and Ni additions (from 2 to 8%) for its mechanical resistance at 400-650°C. 12 references are given.

30073 (CEA-CONF—8124) Study of the hydridation of an uranium alloy containing 0.2 weight percent of vanadium. Dion, L.; Fiot, M.; Fontaine, J.M.; Hemet, P.; Lozes, G. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Sep 1985. 13p. (In French). (CONF-8509147—16). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751340.

From ACTINIDES '85; Aix-en-Provence, France (1 Sep 1985).

The understanding of the hydriding mechanism of the uranium 0.2 wt% vanadium alloy lead us to study the influence of temperature (from room temperature to about 200°C) and hydrogen pressure (up to 10^5Pa) on the reaction kinetic, using ultra-high vacuum technology to minimize the effect of gaseous impurities. After a short nucleation stage, the reaction rate remains constant and takes values higher than those already reported in the literature. The hydriding process cannot be described by a single activated mechanism. A complex hydrided zone is observed under the spall front of the reaction, displaying a double-layer structure: thin hydride precipitates are detected into the underlying metal up to a few microns depth.

30074 (CEA-CONF—8126) Study of crack inititation and propagation in heterogeneous welded joints. Gauthier, J.P.; Petrequim, P. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1985. 48p. (In French). (CONF-8509244—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751370.

From Annual meeting of the International Institute of Welding; Strasbourg, France (2 Sep 1985).

Solicitations of some reactor components requires the evaluation of fatigue resistance of welded joints. For this study a heterogeneous joint between steels A533B and 316L was realized. Crack initiation is studied at 20°C for low cycle fatigue. Measured deformations agree with localization of observed crack initiation which are preferentially in the austenitic deposited from the surface. Crack propagation is slower in the deposited metal and in the joint than in each metal. 13 refs.

30075 (CEA-CONF—8151) Welding of sule elements for nuclear reactors with solid state YAG laser using instrumentated testing equipments. Bourgault, F.; Lacoste, J.; Schley, R.; Kluzinski, C.; Piednoir, P. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1985. 5p. (In French). (CONF-8509235—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751361.

From 2. international conference on radiation technique; Essen, F.R. Germany (17 Sep 1985).

The instrumentation of the equipment for carrying out safety tests on fuel elements for nuclear reactors requires special thermocouples adapted to the prevailing agressive medium. The investigations described deal essentially with the operational and metallurgical weldability tests out on the safety test zircaloy piping in the pressurized water circuit (PHEBUS-programme).

30076 (CEA-CONF—8164) Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation. Alamo, A.; Aubert, H.; Laniesse, J.; Lelong, C.; Pigoury, M.; Foucher, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Oct 1985. 8p. (In French). (CONF-8509238—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751337.

From Franco-Soviet seminar on advanced cladding materials; Moscow, USSR (30 Sep 1985).

Transformation of ferrite into austenite and of austenite into martensite, precipitation of intermetallic phases and tensile properties of the steel Cr13-Mo1.5 are studied in function of Ti additions (from 0 to 3%) and Ni additions (from 2 to 8%) for its mechanical

resistance at 400-650°C for using it as fuel cladding of fast neutron reactors. 12 references are given.

30077 **(CEA-CONF—8279) Study of metallic materials behavior in low oxygen activity atmospheres.** Cayla, O.; Lefort, A.; Sannier, J. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Nov 1985. 8p. (In French). (CONF-8511186—1). NTIS (US Sales Only), PC A02/MF A01 . File Number DE86770098.

From 7. European congress on corrosion; Nice, France (19 Nov 1985).

Structural material for coal gasification plants are placed in atmosphere characterized by low partial oxygen pressure and relatively high carbon and sulfur activity. Industrial alloys developed on oxidizing atmopshere are not adapted. Corrosion tests on alloy 80 H and stainless steel 316 L in gaseous mixture H_2, H_2O, CH_4, CO, CO_2 and H_2S under 60 bars and 1 bar and a creep corrosion test at 1 bar are described. For both materials intergranular corrosion starts at 600°C and is important at 700°C. Corrosion layers are studied by X-rays, luminescence spectrometry and microprobe, the deep layers contain O_2 and Cr, external layers contain mainly iron sulfide and also nickel. In conclusion at 500°C alloy 800 H is promising but at 700°C new materials are required, creep can be modified by corrosion.

30078 **(CEA-N—2454) Influence of titanium on the tempering structure of austenitic steels.** Ghuezaiel, M.J. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Oct 1985. 199p. (In French). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751346.

The microstructure of titanium-stabilized and initially deformed (approximately 20%) austenitic stainless steels used in structures of fast neutrons reactors has been studied after one hour duration annealings (500 <= T <= 800°C) by X-ray diffraction, optical microscopy, microhardness and transmission electron microscopy. The studied alloys were either of industrial type CND 17-13 (0.23 to 0.45 wt% Ti) or pure steels (18% Cr, 14% Ni, 0 or 0.3 wt% Ti). During tempering, the pure steels presented some restauration before recrystallization. In the industrial steels, only recrystallization occurred, and this only in the most deformed steel. Precipitation does not occur in the titanium-free pure steel. In industrial steels, many intermetallic phases are formed when recrystallization starts.

30079 (CONF-850314—Vol.2, pp 51-56) **Extended storage of low-level radioactive waste: potential problem areas.** Siskind, B.; Dougherty, D.R.; MacKenzie, D.R. (Brookhaven National Lab., Upton, NY). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357. Contract AC02-76CH00016.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

If a state or state compact does not have adequate disposal capacity for low-level radioactive waste (LLRW) by 1986 as required by the Low-Level Waste Policy Act, then extended storage of certain LLRW may be necessary. In this paper, the issue of extended storage of LLRW is addressed in order to determine for the Nuclear Regulatory Commission the areas of concern and the actions recommended to resolve these concerns. The focus is on the properties and behavior of the waste form and waste container. Storage alternatives are considered in order to characterize the likely storage environments for these wastes. The areas of concern about extended storage of LLRW are grouped into two categories: (1) Behavior of the waste form and/or container during storage, e.g., radiolytic gas generation, radiation enhanced degradation of polymeric materials, and corrosion. (2) Effects of extended storage on the properties of the waste form and/or container that are important after storage (e.g., radiation-induced oxidative embrittlement of high-density polyethylene and the weakening of steel containers resulting from corrosion by the waste). The additional information and actions required to address these concerns are discussed and, in particular, it is concluded that further information is needed on the rates of corrosion of container material by Class A wastes and on the apparent dose-rate dependence of radiolytic processes in Class B and C waste packages. Modifications to the guidance for solidified wastes and high-integrity containers in NRC's Technical Position on Waste Form are recommended.

30080 **(CONF-860421—25) Postirradiation tensile behavior of nickel-doped ferritic steels.** Klueh, R.L.; Maziasz, P.J.; Vitek, J.M. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 19p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009502.

From 2. international conference on fusion reactor materials (ICFRM-2); Chicago, IL, USA (13 Apr 1986).

Tensile specimens of normalized-and-tempered 9Cr-1MoVNb, 9Cr-1MoVNb-2Ni, 12Cr-1MoVW, 12Cr-1MoVW-1Ni, and 12Cr-1MoVW-2Ni were irradiated in the Experimental Breeder Reactor at 390, 450, 500, and 550°C to displacement-damage levels of approximately 16 dpa. The only difference in the effect of irradiation on the tensile behavior of the nickel-doped and undoped steels was attributed to the difference in tempering treatments the two types of steels received. The nickel-doped steels were stronger prior to irradiation due to a lower tempering temperature. After irradiation, the properties of the steels with and without nickel were similar, indicating that the presence of nickel did not affect the behavior of the steels during irradiation. Nickel was added to the steels to study the effect of helium on the properties of these steels. Helium can be formed in an alloy containing nickel by irradiating in a mixed-spectrum reactor. To help determine the effect of helium on properties, these steels are also being irradiated in fast reactors, where little helium is formed. The present fast-reactor results indicate that it is feasible to use the nickel-doped ferritic steels to study helium effects.

30081 **(CONF-860421—28) Development of ferritic steels for reduced activation: the US program.** Klueh, R.L.; Gelles, D.S.; Lechtenberg, T.A. (Oak Ridge National Lab., TN (USA); Hanford Engineering Development Lab., Richland, WA (USA); GA Technologies, Inc., San Diego, CA (USA)). 1986. Contract AC05-84OR21400. 32p. NTIS, PC A03. File Number DE86010025.

From 2. international conference on fusion reactor materials (ICFRM-2); Chicago, IL, USA (13 Apr 1986).

The Cr-Mo ferritic (martensitic) steels are candidates for the structural components of fusion reactors. Irradiation of such steels in a fusion environment produces long-lived radioactive isotopes, which lead to difficult radioactive waste disposal problems once the structure is removed from service. Such problems could be reduced by using steels that contain only elements that produce radioactive isotopes that decay to low levels in a reasonable time (tens of years instead of hundreds or thousands of years). The US Department of Energy has a program to develop steels to meet the criteria for shallow land burial as opposed to deep geologic storage. A review of the alloy development programs indicates that ferritic steels that meet these criteria can be developed.

30082 **(CONF-860605—2) Gas-bubble growth mechanisms in the analysis of metal fuel swelling.** Gruber, E.E.; Kramer, J.M. (Argonne National Lab., IL (USA)). Jun 1986. Contract W-31-109-ENG-38. 21p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86005512.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

During steady-state irradiation, swelling rates associated with growth of fission-gas bubbles in metallic fast reactor fuels may be expected to remain small. As a consequence, bubble-growth mechanisms are not a major consideration in modeling the steady-state fuel behavior, and it is usually adequate to consider the gas pressure to be in equilibrium with the external pressure and surface tension restraint. On transient time scales, however, various bubble-growth mechanisms become important components of the swelling rate. These mechanisms include growth by diffusion, for bubbles within grains and on grain boundaries; dislocation nucleation at the bubble surface, or "punchout"; and bubble growth by creep. Analyses of these mechanisms are presented and applied to provide information on the conditions and the relative time scales for which the various processes should dominate fuel swelling. The results are compared to a series of experiments in which the swelling of irradiated metal fuel was determined after annealing at various tempera-

tures and pressures. The diffusive growth of bubbles on grain boundaries is concluded to be dominant in these experiments.

30083 (CONF-860605—6) Radiation-induced segregation and precipitation in molybdenum-rhenium alloys. Erck, R.A.; Wayman, C.M.; Rehn, L.E. (Argonne National Lab., IL (USA); Illinois Univ., Urbana (USA). Dept. of Metallurgy and Mining Engineering). Feb 1986. Contract W-31-109-ENG-38. 20p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007521.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

Specimens of Mo-7 at. % Re and Mo-30 at. % Re were irradiated with 1.8 MeV $^4He^+$ ions at elevated temperatures. Radiation-induced segregation of Re was measured during irradiation by in situ Rutherford backscattering spectrometry. Segregation of the undersized Re atoms in the same direction as the defect fluxes, i.e., toward the external surface, was observed. The amount of Re enrichment in the near-surface region was measured as a function of temperature and of dose at a calculated near-surface displacement rate near 1 x 10^{-4}dpa/s. Segregation was observed at temperatures from 800 to 1500°C in Mo-7Re, and from 850 to 1225°C in Mo-30Re. Irradiated disks were examined by transmission electron microscopy. Precipitates of Chi phase were observed on grain boundaries, or in a thin layer at the irradiated surface in Mo-30Re after irradiation at temperatures from 750 to 1075°C. Frequently, Chi precipitates formed with a crystallographic twin orientation with respect to the host matrix. No voids were observed for doses up to 1.6 dpa.

30084 (CONF-860605—8) Solute segregation and microstructural evolution in ion-irradiated vanadium-base alloys. Loomis, B.A.; Kestel, B.J.; Gerber, S.B. (Argonne National Lab., IL (USA)). Feb 1986. Contract W-31-109-ENG-38. 26p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86007513.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

The microstructural evolution in V+14.7 a/o Cr, V+2.5 a/o Mo, V+2.5 a/o W, V+8.0 a/o Ni, V+5.3 a/o Ti, V+14.7 a/o Cr + 5.2 a/o Ti, V+9.6 a/o Cr + 3.1 a/o Fe+0.7 a/o Zr, and V+3.2 a/o Ti + 1.8 a/o Si alloys, and unalloyed V was determined from observations of specimens by TEM following 4.0-MeV $^{51}V^{++}$ ion irradiation at 900 to 970°K to 50 dpa. The RIS of solutes in the ion-irradiated alloys was investigated by AES, EDXS, and EELS analyses. The RIS of solutes and microstructural evolution in the irradiated alloys were correlated with the solute diffusivity and the relative chemical affinity of the substitutional solutes for oxygen.

30085 (CONF-860605—9) Effect of neutron irradiation on the tensile properties and microstructure of several vanadium alloys. Braski, D.N. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 34p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008234.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

Specimens of V-15Cr-5Ti, VANSTAR-7, and V-3Ti-1Si were encapsulated in TZM tubes containing ^7Li to prevent interstitial pickup and irradiated in FFTF (MOTA experiment) to a damage level of 40 dpa. The irradiation temperatures were 420, 520, and 600°C. For a better simulation of fusion reactor conditions, helium was preimplanted in some specimens using a modified version of the "tritium trick." The V-15Cr-5Ti alloy was most susceptible to irradiation hardening and helium embrittlement, followed by VANSTAR-7 and V-3Ti-1Si. VANSTAR-7 exhibited a relatively high maximum void swelling of ~6% at 520°C while V-15Cr-5Ti and V-3Ti-1Si had values of less than 0.3% at all three temperatures. The V-3Ti-1Si clearly outperformed the other two vanadium alloys in resisting the effects of neutron irradiation.

30086 (CONF-860605—10) Effect of cold work on tensile behavior of irradiated type 316 stainless steel. Klueh, R.L.; Maziasz, P.J. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 35p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008491.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

Tensile specimens were irradiated in ORR at 250, 290, 450, and 500°C to produce a displacement damage of ~5 dpa and 40 at. ppM He. Irradiation at 250 and 290°C caused an increase in yield stress and ultimate tensile strength and a decrease in ductility relative to unaged and thermally aged controls. The changes were greatest for the 20%-cold-worked steel and lowest for the 50%-cold-worked steel. Irradiation at 450°C caused a slight relative decrease in strength for all cold-worked conditions. A large decrease was observed at 500°C, with the largest decrease occurring for the 50%-cold-worked specimen. No bubble, void, or precipitate formation was observed for specimens examined by transmission electron microscopy (TEM). The irradiation hardening was correlated with Frank-loop and "black-dot" loop damage. A strength decrease at 500°C was correlated with dislocation network recovery. Comparison of tensile and TEM results from ORR-irradiated steel with those from steels irradiated in the High Flux Isotope Reactor and the Experimental Breeder Reactor indicated consistent strength and microstructure changes.

30087 (CONF-860605—11) Ion damage microstructures in a Fe-10Cr-6Mo-0.5Nb ferritic steel. Farrell, K.; Lee, E.H. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86008500.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

An annealed-and-aged ferritic steel containing fine NbC precipitates and relatively coarse particles of Laves phase was bombarded with 4-MeV iron ions to 100 displacements per atom (dpa) at 400 to 600°C. Much of the damage structure consisted of dislocation tangles that coarsened with increasing temperature. Cavity formation began at 450°C, peaked at 500 to 550°C and was absent at 600°C. Maximum swelling was only 0.2%. The Laves particles exhibited recoil dissolution and restructuring. Bombardments with Fe + He + D or Fe + He beams at ratios of 10 atomic parts per million (appM) He/dpa and 45 appM D/dpa introduced high concentrations of very small bubbles and comparatively few larger, bias-driven cavities. The latter were initiated at bubble clusters on NbC particles. Maximum swelling of 0.75% occurred at 550°C. Recoil dissolution of the Laves phase was retarded by the gases. Large critical cavity sizesand unbalanced dislocation and cavity sink strengths contribute to low swelling of this alloy.

30088 (CONF-860605—13) Radiation-induced segregation in light-ion bombarded Ni-8% Si. Packan, N.H.; Heatherly, L.; Kesternich, W.; Schroeder, H. (Oak Ridge National Lab., TN (USA); Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). 1986. Contract AC05-84OR21400. 25p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009155.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

Tensile specimens 60 μm thick of Ni-8 at. % Si have been bombarded at 475°C to doses of 0.1 to 0.3 dpa with either 7 MeV proton or 28 MeV alpha particle beams. Deliberate embrittlement by high temperature (700°C) preimplantation of helium was required to produce intergranular fracture. Depth profile sputtering and analysis in a Scanning Auger Microprobe was then used to study radiation-induced segregation of silicon both at the external surfaces and at internal interfaces. The external surfaces exhibited a strongly silicon-enriched zone for the first 10 to 20 nm followed by a broad (~200 nm), shallow silicon-depleted region. Segregation of silicon to grain boundaries varied from interface to interface and possibly from region to region on a given interface. In general, however, depth profiles of silicon content with distance from internal boundaries showed no noticeable depletion zone and a more gradual fall-off compared to the profiles from external surfaces. The variations of RIS among boundaries and with type of interface probably reflect, at least in part, intrinsic differences in sink efficiency.

30089 (CONF-860610—5) Vanadium alloys for fusion reactor first wall application. Braski, D.N.; Tortorelli, P.F. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86005383.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

The first wall of a tokamak-type of fusion reactor separates the blanket/coolant from the plasma, provides for mechanical stability of the torus, and maintains a vacuum in the plasma chamber. Current tokamak designs require the first wall to withstand a neutron flux of 0.4 to 1.2 x 10^{19} neutrons m^{-2} s^{-1}, with 20% of the neutrons having an energy of 14.1 MeV. In addition to the high displacement damage, fusion neutrons will produce 20 to 30 times more helium and hydrogen in the wall than a reactor like EBR-II. Recently, the need for the first wall to demonstrate a low residual activity created a renewed interest in the refractory metal vanadium. Compared to the austenitic and ferritic stainless steels, vanadium and its alloys also provide lower thermal stresses for given flux, good strength at elevated temperatures, excellent compatibility with Li (a proposed coolant/blanket material), and lower nuclear heating, helium generation, and void-swelling rates. Major concerns regarding the use of vanadium alloys for a first wall include: cost, reactivity with light elements (C,N,O,H) as well as various coolant/blanket materials, and resistance to radiation damage. These latter two areas will be reviewed in this paper.

30090 (CONF-860610—21) In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures. Liu, K.C. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007322.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

Refractory metal alloys have been proposed for fusion reactor and space power applications because of their high temperature strength, low thermal stress properties, good compatibility with liquid metal coolants and radiation resistance. However, little is known about the cyclic fatigue properties which are important to some fusion reactor first wall systems that operate in thermal cycles. This paper presents limited results of in-vacuum cyclic fatigue tests on Vanstar-7 (9Cr-3Fe-Zr) at room temperature, 550 and 650°C. Miniature hourglass-shaped specimens were used with a gage diameter of 3.18 mm. The material was annealed 1 h in vacuum at 1400°C before machining, to produce an average grain size of ASTM No. 7. The specimens were stress relieved for 0.5 h at 1400°C after machining. Tests were performed on a servocontrolled hydraulic testing system equipped with a vacuum chamber capable of pressures below 10^{-5} Pa. Specimens were heated by an induction heater, maintaining temperatures within +-2°C of the nominal temperature during the test. A diametral extensometer was used, but axial strain calculated via a strain computer was used for machine control. A fully reversed triangular wave function beginning with compression was employed at a strain rate of 4 x 10^{-3} s^{-1} for all low-cycles tests. High cycle testing was conducted initially in strain control but switched to load control after stable essentially elastic cycling was established.

30091 (DOE/NASA/50112—64) Composition optimization of self-lubricating chromium carbide-based composite coatings for use to 760°C. DellaCorte, C.; Sliney, H.E. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. Contract AI01-85CE50112. 27p. (NASA-TM—87261; CONF-860516—2). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008113.

From Annual meeting of the American Society of Lubrication Engineers; Toronto, Ontario, Canada (12 May 1986).

This paper describes new compositions of self-lubricating coatings that contain chromium carbide. A bonded chromium carbide was used as the "base stock" because of the known excellent wear resistance and the chemical stability of chromium carbide. "Additives" were silver and barium fluoride/calcium fluoride eutectic. The coating constituents were treated as a ternary system consisting of: (1) the bonded carbide base material, (2) silver, and (3) the eutectic. A study to determine the optimum amounts of each constituent was performed. The various compositions were prepared by powder blending. The blended powders were then plasma sprayed onto a superalloy substrates and diamond ground to the desired coating thickness. Friction and wear studies were performed at temperatures from 25 to 760°C in helium and hydrogen. A variety of counterface materials were evaluated with the objective of discovering a satisfactory metal/coating sliding combination for potential applications such as piston ring/cylinder liner couples for Stirling engines.

30092 (EUR—9836) Corrosion behaviour of container materials for geological disposal of high level radioactive waste. Accary, A. (Commission of the European Communities, Luxembourg). 1985. 105p. NTIS (US Sales Only), PC A06/MF A01. File Number DE86751643.

The disposal of high level radioactive waste in geological formations, based on the multibarrier concept, may include the use of a container as one of the engineered barriers. In this report the requirements imposed on this container and the possible degradation processes are reviewed. Further on an overview is given of the research being carried out by various research centres in the European Community on the assessment of the corrosion behaviour of candidate container materials. The results obtained on a number of materials under various testing conditions are summarized and evaluated. As a result, three promising materials have been selected for a detailed joint testing programme. It concerns two highly corrosion resistant alloys, resp. Ti-Pd (0.2 Pd%) and Hastelloy C4 and one consumable material namely a low carbon steel. Finally the possibilities of modelling the corrosion phenomena are discussed. 4 figs., 16 tables, 33 refs.

30093 (EUR—9865) Research on erosion and corrosion of cobalt-free materials. Wieling, N.; Hofmann, P.J. (Commission of the European Communities, Luxembourg). 1985. 45p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751642.

Cobalt alloys have to date been the preferred material in nuclear power stations for valve sealing surfaces. These are to be replaced with cobalt-free materials. In addition to performing well under dry sliding friction conditions, the cobalt-free alloys must also exhibit good corrosion resistance properties in the presence of borated water at 320°C and high resistance to erorion corrosion. Even cases of hydroabrasive wear must be anticipated which can be caused by entrained solid particles in the flowing medium. Due to the complex mechanisms involved, it has not yet been possible to predict from theory the resistance of multi-phase alloys to high-velocity media. Therefore experiments were carried out under practical conditions to determine the resistance of one cobalt alloy (reference material) and seven cobalt-free alloys. The following was established: 1. In the case of attack caused solely by erosion corrosion (solid-free medium), the test materials exhibited only minor differences, whereas wear due to hydroabrasion (medium containing solids) yielded considerable dissimilarities. 2. In both cases the order of merit of the materials was almost identical; no influence of the material hardness on material wear could be detected. 3. An iron-based alloy (with good friction properties) exhibited the same resistance as or greater resistance than the reference material.

30094 (EUR—9875) Comparison of the tensile properties of 9-12% Cr. steels. (Pt. 1) data files, (Pt. 2) final report. Nieuwland, H.C.D.; Brunor, G.; Grosser, E.D.; Petrequin, P.; Vanderborck, Y.; Wood, D.S. (Commission of the European Communities, Luxembourg). 1985. 158p. NTIS (US Sales Only), PC A08/MF A01. File Number DE86751648.

A compilation of tensile properties of 9-12% Cr steels for fast breeders has been executed by CEC-member states. These data files will be analyzed and compared under the work, which is agreed upon as Part II. In the absence of a common data bank the CEC-member states contributed from their experience with 9%Cr 1%Mo steel, 9%Cr 2%Mo steel and 12%Cr steel in order to form a sound data basis. England and Italy compiled the information of 75 melts of 9%Cr 1%Mo steel. Belgium and France reported 45 melts of 9%Cr 2%Mo steel. Interatom and Neratoom contributed with 36 melts of 12%Cr steel. The tensile data are compiled between RT and 600°C in 50°C intervals and comprise Rsub(p O,2), Rsub(m), reduction of area and elongation. Chemical analysis and

condition (heat treatment) are given. The microstructure is described as far as possible.

30095 **(GKSS—85/E/29) Investigations of the vibrational corrosion of structural steels in seawater.** Schmelzer, F.; Schmitt, F.J. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.); GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Werkstofftechnologie und Chemie). 1985. 54p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751721.

The investigations give some results on the crack growth behaviour of the high yield strength steel Fe E 690. The tests were performed with frequencies simulating those of the sea. Crack growth was determined in air, in artificial seawater with a free corrosion potential, and in seawater with a cathodic potential. The results were compared with those of the offshore construction steels Fe 360 and Fe E 355. Further tests were performed in order to study the influence of specimen thickness on crack growth behaviour. The production of hydrogen as a consequence of the cathodic polarisation has an influence on the formation of a plateau in range II of the crack growth curve. As a function of the yield strength of the steels tested, a different proneness to hydrogen-induced stress corrosion cracking was found. (orig./IHOE).

30096 **(HEDL-SA—3291) Insights into the fracture toughness of martensitic stainless steels using stereoscopic fractographic measurements.** Gelles, D.S. (Hanford Engineering Development Lab., Richland, WA (USA)). Aug 1985. Contract AC06-76FF02170. 5p. (CONF-851104—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009415.

From Fundamental aspects of fracture; Gatlinburg, TN, USA (4 Nov 1985).

Stereoscopic fractographs of precracked compact tension and precracked miniature Charpy specimens can provide critical crack opening displacements (δ/sub c/) on a microstructural scale. The critical crack opening displacement can be related to the critical crack extension force (G/sub c/) by the Wells relationship G/sub c/ = n σ/sub y/ δ/sub c/ where n is the plastic stress intensity factor and σ/sub y/ is the yield stress. This approach has been used to examine the fracture behavior of two martensitic stainless steels. Examinations on a microstructural scale were compared with J/sub Ic/ measurements in order to assess the validity of the Wells relationship. It was found that the two modes of crack extension, stretching and crack propagation, were clearly defined but that an intermediate stage also occurred. This intermediate stage was a precursor to crack propagation but differed from crack propagation in that crack tip blunting eventually slowed propagation and returned extension to the stretching mode. This intermediate stage is very localized, creates a unique fracture appearance and produces uncertainty in the determination of a precise value for J/sub Ic/.

30097 **(HEDL-SA—3407-FP) Microstructural examination of pure copper and three copper alloys irradiated in FFTF.** Brager, H.R.; Garner, F.A. (Hanford Engineering Development Lab., Richland, WA (USA)). Dec 1985. Contract AC06-76FF02170. 9p. (CONF-860421—24). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009417.

From 2. international conference on fusion reactor materials (ICFRM-2); Chicago, IL, USA (13 Apr 1986).

This paper examines the microstructure of the high purity copper and three commercial alloys whose macroscopic properties were least influenced by the fast reactor irradiation. While pure copper evolved in a manner consistent with the behavior of other pure metals, the dispersion-hardened Al-25 alloy appeared to be essentially unaffected by radiation. The Al_2O_3 dispersoids are not changed by radiation and the matrix shows no evidence of void or bubble formation and very little evidence of dislocation evolution. The solution-strengthened alloy MZC also showed no evidence of void formation but exhibited several types of precipitation, which may account for the 1% increase in density that was measured after irradiation. In the precipitation-strengthened alloy CuBeNi voids formed in those regions (~75%) which had recrystallized and not in those regions resisting recrystallization. The recrystallized regions also contained large precipitates which are rich in beryllium and were often surrounded by void halo's resulting form transmutation of beryllium to helium. In the unrecrystallized regions there was a high density (~5 x 10^{16} cm^{-3}) of small (~5 mm) precipitates.

30098 **(LA-UR—85-3389) Technique for megabar controlled strain experiments.** Staudhammer, K.P.; Johnson, K.A. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 7p. (CONF-860616—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE86000805.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

This design allows in one shot one experiment a range of pressures from 12 to 170 GPa and a selectable strain range (0 to 55%) in 304 stainless steel with 100% recovery. Development of the application of griding has enabled correlation, locally, of pressure and strain with structure and properties at a strain rate of 10^6/s. Appropriate variations in momentum trap design can control strain in cylindrical implosion shock experiments. Pedestal type traps have shown significant improvement in the reduction of strain in cylindrical implosion experiments. Such design would seem to be appropriate for experiments on brittle and ceramic materials. In cylindrical designs the degree of macro-strain is a function of trapping and is the result of reflected waves not the primary shock pulse.

30099 **(LA-UR—86-733) Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys.** Brown, R.D.; Wechsler, M.S.; Tschalaer, C. (Los Alamos National Lab., NM (USA); Iowa State Univ. of Science and Technology, Ames (USA); Schweizerisches Inst. fuer Nuklearforschung, Villigen). 1986. Contract W-7405-ENG-36. 25p. (CONF-860605—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE86007372.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

A spallation neutron source for the 600-MeV proton accelerator facility at the Swiss Institute for Nuclear Research (SIN) consists of a vertical cylinder filled with molten Pb-Bi. The proton beam enters the cylinder, passing upward through a window in contact with the Pb-Bi eutectic liquid. Investigations are underway at the 800-MeV proton accelerator at LAMPF to test the performance of candidate SIN window materials. Based on considerations of chemical compatibility with molten Pb-Bi, as well as radiation damage mechanisms, Fe, Ta, Fe-2.25Cr-1Mo, and Fe-12Cr-1Mo (Ht-9) were chosen as candidate materials. Sheet tensile samples were sealed inside capsules containing Pb-Bi and were proton-irradiated at LAMPF to two fluences, 4.8 and 54 x 10^{23} p/m^2. The beam current was approximately equal to the 1 mA anticipated for the upgraded SIN accelerator. Yield and ultimate strengths increased upon irradiation in all materials, while the ductility decreased. The pure metals, Ta and Fe, exhibited the greatest radiation hardening and embrittlement. The HT-9 alloy showed the smallest changes in strength and ductility.

30100 **(LBL—20485) Design of tough ferritic steels for cryogenic use.** Morris, J.W. Jr. (Lawrence Berkeley Lab., CA (USA)). Oct 1985. Contract AC03-76SF00098. 39p. (CONF-8603110—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009361.

From Symposium on structure/property relationships; New Orleans, LA, USA (3 Mar 1986).

This paper describes the design of ferritic steels and weldments that combine strength and toughness at cryogenic temperatures. The alloy must have a ductile-brittle transition temperature below the intended service temperature and a high fracture toughness in the ductile mode. Its systematic design uses the microstructure-property relations that govern the transition temperature and fracture toughness to identify a suitable microstructure, and then employs the microstructure-processing relations that govern its thermal response to manipulate the microstructure into the appropriate form. The procedure is illustrated by describing the heat treatments, microstructures and properties of a variety of laboratory and commercial alloys, including conventional "9Ni" steel, the low-Ni and Fe-Mn ferritic steels that have been developed as an alternative to 9Ni, the 12Ni steels that are promising for use at 4K, and the welding procedures and ferritic filler metals that are useful for ferritic cryogenic steels.

30101 **(N—86-14303) Evaluation of cold isostatic pressing for high pressure thrust chambers.** (National Aerospace Lab., Chofu, Tokyo (Japan)). 1985. 31p. (NAL-TR—858). NTIS, PC A03/MF A01.

The objectives of this program have been to investigate new fabrication methods and design techniques, which potentially reduce fabrication time and cost, and also increase rocket thrust chamber life. For these purposes, the authors have developed the CIP (Cold Isostatic Pressing) forming method based on powder metallurgy. With the CIP forming method, a very complaint closeout is easily obtained while sustaining sufficient bonding strength between the copper liner and the closeout, and providing perfect sealing of coolant channels. A metallurgical test was performed before the fabrication of a trial combustion chamber to determine the forming conditions of the sintered closeout which would fulfill the required design conditions. A trial combustion chamber with an OFHC (Oxygen Free High Conductivity) copper liner was then made for a design combustion pressure of 15 MPa and thrust level of 10kN. The combustion tests of the trial combustion chamber were conducted at chamber pressure of up to 9 MPa for 10 runs to confirm the reliability of the CIP formed chamber.

30102 **(N—86-17530) High temperature oxidation and hot corrosion of nickel and cobalt based superalloys.** Patnaik, P.C. (National Aeronautical Establishment, Ottawa, Ontario (Canada)). Oct 1985. 37p. NTIS, PC A03/MF A01.

Oxidation and hot corrosion are often the two most important modes of degradation that superalloys undergo in a high temperature gas turbine atmosphere. In general, the corrosion resistance of superalloys has been sacrificed to achieve adequate high temperature strength. Therefore turbine blade and vane materials are often protected from these modes of degradation by the use of protective coatings. Three classes of coating materials based on aluminizing, chromizing and more recently siliconizing treatments are usually considered due to their resistance to oxidation, sulfidation (hot corrosion) processes. The oxidation and hot corrosion properties of superalloys and coating materials of relevance to aero gas turbine engine hot-section are reviewed, with particular emphasis on the interaction between gas phase or molten salt deposits and the substrate alloy/coating system. Recent theories on these processes are reviewed. Finally, the effects of erosion on the corrosion properties of superalloys and coatings are also discussed.

30103 **(NUREG/CR—4437) Exploratory studies of element interactions and composition dependencies in radiation sensitivity development.** Hawthorne, J.R. (Materials Engineering Associates, Inc., Lanham, MD (USA)). Nov 1985. 92p. (MEA—2113). NTIS, PC A05/MF A01 - GPO. File Number TI86900380.

This investigation with laboratory melts of pressure vessel steels (A 533-B or A 302-B base) probes suspect interactions between copper impurities and manganese, molybdenum, chromium and nickel alloying as influencing elevated temperature, radiation sensitivity development. The investigation also qualifies the influence of phosphorus content on radiation sensitivity as a function of copper content and explores suspect contributions of tin and arsenic. Radiation resistance is judged on the basis of Charpy-V (C/sub v/) notch ductility before and after 288°C irradiation to ~2.5 x 10^{19} n/cm^2, E > 1 MeV. The findings demonstrate clearly that important composition interactions exist in radiation sensitivity development. 13 figs.

30104 **(NUREG/CR—4579) Application of the key curve and multi-specimen techniques to dynamic J-R Curve testing of alloy steel.** Joyce, J.A.; Hackett, E.M. (Naval Academy, Annapolis, MD; David W. Taylor Naval Ship Research and Development Center, Annapolis, MD (USA)). Apr 1986. 63p. NTIS, PC A04/MF A01 - GPO. File Number TI86901252.

J-integral R-Curve tests were performed on three point bend specimens of a 3-Ni steel at three loading rates - quasi-static, intermediate (25mm/s) and a drop tower rate (2.54m/s). The key curve and multi-specimen procedures were employed for the higher rate tests and this investigation is focused primarily on details of the test method development. The multi-specimen and key curve techniques were found to yield upper shelf J-R Curves which were in substantial agreement at the elevated loading rates. Numerical smoothing techniques required to apply a key curve method appear to separate the oscillatory high frequency component from the load-displacement record. For the 3-Ni steel tested for this investigation both J/sub Ic/ and T were found to be elevated with increasing loading rate.

30105 **(PNL-SA—13067) Grain boundary segregation and environmentally-induced fracture of materials.** Jones, R.H. (Pacific Northwest Labs., Richland, WA (USA)). Aug 1985. Contract AC06-76RL01830. 24p. (CONF-860340—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE86010219.

From 115. American Institute of Mining, Metallurgical and Petroleum Engineers annual meeting; New Orleans, LA, USA (2 Mar 1986).

Segregation of metalloid impurities such as S, P, and Sb to grain boundaries can induce hydrogen embrittlement (HE) and intergranular stress corrosion cracking (IGSCC) of materials. Hydrogen-induced intergranular subcritical crack growth is affected by metalloid segregation with a combined impurity-hydrogen effect which follows the embrittling trend for impurity segregation in the absence of hydrogen. In Fe, S is more effective than Sb which is more effective than P. A similar relationship has been demonstrated for Ni. The role of metalloid impurity segregation in IGSCC may differ significantly from HE such that an impurity which has a small effect in HE can have a large effect in IGSCC. Sulfur and P in Ni are examples where this role reversal is observed. 29 refs., 13 figs.

30106 **(Y/DV—420) Computer simulation of quenching uranium-0.75% titanium penetrator blanks. Final report for FY 1984.** Llewellyn, G.H.; Aramayo, G.A.; Childs, K.W.; Ludtka, G.M.; Siman-Tov, M. (Oak Ridge Y-12 Plant, TN (USA)). Feb 1985. Contract AC05-84OS21400. 242p. NTIS, PC A11/MF A01; 1; GPO Dep. File Number DE86010139.

The models developed can be used as a basis to understand, study, and optimize the process. Information obtained from these models can be used to analytically predict temperature distribution, cooling rates, stresses, deformation, phase composition, and possibly the prediction of void formations, all as functions of both position and time. It was demonstrated that nonsymmetrical boundary conditions can lead to bowing of the penetrator blanks and applicable techniques were developed to optimize the quenching process. Experiments for deriving physical and mechanical properties for the uranium-0.75% Ti alloy including data on the heats of transformation have been performed. It is concluded that the contribution of the transformation heat constitutes about 19% of the total heat transfer involved and is, therefore, a significant factor affecting the metallurgical behavior of the alloy during the quenching operation. This behavior is less sensitive to the dependence of the property data on temperature.

30107 **Maraging superalloys and heat treatment processes.** Korenko, M.K.; Gelles, D.S.; Thomas, L.E. (to Dept. of Energy). US Patent 4,572,738. 25 Feb 1986. Filed date 21 Apr 1982. vp.

This patent describes an iron base composition maraging superalloy characterized by a gamma prime strengthened microstructure, wherein beta prime precipitates, and gamma prime precipitates are dispersed in a ferritic matrix. The maraging superalloy consisting essentially of the following elements; approximately 18 to 25 weight percent Ni; approximately 4 to 8 weight percent Cr; approximately 0.5 to 1.5 weight percent of Mo, a solid soultion strengthening agent; approximately 1.5 to 3.5 weight percent Ti; approximately 0.4 to 2.5 weight percent Al; and with Fe forming essentially the balance of the iron base composition maraging supperalloy.

30108 **Brazing technique.** Harast, D.G. (to Dept. of Energy). US Patent 4,572,939. 25 Feb 1986. Filed date 27 Jan 1984. vp.

This patent describes a method of brazing components comprising the steps of: sand blasting the components with particles of a brazing material to clean the surfaces of the components and to

embed brazing material in the surfaces; applying the brazing material to the components' surfaces; and heating the brazing material to form a brazement between the components.

30109 **Method of measuring metal coating adhesion.** Roper, J. R. (to The United States of America as represented by the United States Department of Energy). US Patent 4,541,287. 17 Sep 1985. Filed date 28 Mar 1983. vp.

PAT-APPL-479761.

A method for measuring metal coating adhesion to a substrate material comprising the steps of preparing a test coupon of substrate material having the metal coating applied to one surface thereof, applying a second metal coating of gold or silver to opposite surfaces of the test coupon by hot hollow cathode process, applying a coating to one end of each of two pulling rod members, joining the coated ends of the pulling rod members to said opposite coated surfaces of the test coupon by a solid state bonding technique and finally applying instrumented static tensile loading to the pulling rod members until fracture of the metal coating adhesion to the substrate material occurs.

30110 **Metal-to-ceramic attachment device.** Pavelka, E. A.; Grindstaff, Q. G.; Scheppele, S. E. (to The United States of America as represented by the United States Department of Energy). US Patent 4,540,304. 10 Sep 1985. Filed date 8 Mar 1983. vp.

PAT-APPL-473821.

A metal-to-ceramic fastening device is disclosed for securing a metal member to a ceramic member with respective confronting surfaces thereon clamped together, comprising a threaded bolt adapted to extend through a bolt hole in the metal member and into an aligned opening in the ceramic member, a rod nut threadedly receiving the bolt and adapted to span the opening in the ceramic member, and a pressure limiting member received on the bolt between the nut and the confronting surface of the metal member for limiting the movement of the nut toward the metal member when the bolt is tightened, so as to limit the pressure applied by the nut to the ceramic member to avoid damage thereto. The fastening device also prevents damage to the ceramic member due to thermal stresses. The pressure limiting member may have a shallow dish-shaped depression facing the rod nut to assist in accommodating thermal stresses.

30111 **Bulk and surface valence of $YbBe_{13}$.** Frank, K.H.; Reihl, B.; Fisk, Z.; Schmiester, G. (IBM Research Lab., Zurich, Switzerland; Los Alamos National Lab., NM, United States of America; Freie Univ. Berlin, Germany, F.R. Inst. fuer Atom- und Festkoerperphysik). *Journal of the Less-Common Metals;* 111: 251-256(Sep 1985). (CONF-850373—).

From International rare earth conference on materials and chemistry; Zurich, Switzerland (4 Mar 1985).

The authors report angle-integrated photoemission results on clean and oxidized $YbBe_{13}$ samples, at and below 300 K, which show $YbBe_{13}$ to have a trivalent bulk and a divalent surface layer. The bulk valence, independently derived from temperature-dependent Lsub(III)-edge X-ray absorption measurements, is found to be three.

30112 **Electrically conductive containment vessel for molten aluminum.** Holcombe, C. E.; Scott, D. G. (to The United States of America as represented by the United States Department of Energy). US Patent 4,528,939. 16 Jul 1985. Filed date 25 Jun 1984. vp.

PAT-APPL-623875.

The present invention is directed to a containment vessel which is particularly useful in melting aluminum. The vessel of the present invention is a multilayered vessel characterized by being electrically conductive, essentially nonwettable by and nonreactive with molten aluminum. The vessel is formed by coating a tantalum substrate of a suitable configuration with a mixture of yttria and particulate metal borides. The yttria in the coating inhibits the wetting of the coating while the boride particulate material provides the electrical conductivity through the vessel. The vessel of the present invention is particularly suitable for use in melting aluminum by ion bombardment.

30113 **Summary abstract: reduction of tritium permeation through iron using aluminum ion implantation.** Musket, R.G.; Steward, S.A.; Brown, D.W.; Uribe, F.S. (Lawrence Livermore National Lab., CA). *Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films;* 2: No. 2, 723-724(Apr-Jun 1984). Contract W-7405-ENG-48.

Although ion implantation has been shown to be an excellent technique for modifying many surface properties of metallurgical materials, this study provided the first data on its use to reduce the permeation of a gas through a material. In particular, the initial results of a study using aluminum ion implantation combined with a postimplant treatment for creation of a barrier to tritium permeation through polycrystalline iron are summarized.

30114 **Orbital effects in actinide systems.** Lander, G.H. (Argonne National Laboratory, Argonne, IL). pp 207-213 of Moment formation in solids. Buyers, W.J.L. New York, NY; Plenum Press (1984). (CONF-8308132—).

From NATO/CAP institute on moment formation in solids; Vancouver Island, Canada (21 Aug 1983).

Actinide magnetism presents a number of important challenges; in particular, the proximity of 5f band to the Fermi energy gives rise to strong interaction with both d and s like conduction electrons, and the extended nature of the 5f electrons means that they can interact with electron orbitals from neighboring atoms. Theory has recently addressed these problems. Often neglected, however, is the overwhelming evidence for large orbital contributions to the magnetic properties of actinides. Some experimental evidence for these effects are presented briefly in this paper. They point, clearly incorrectly, to a very localized picture for the 5f electrons. This dichotomy only enhances the nature of the challenge.

30115 **Radiative decay of surface plasmons on nonspherical silver particles.** Little, J.W.; Arakawa, E.T.; Callcott, T.A.; Ferrell, T.L. (Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, TN). pp 233-238 of The physics of submicron structures. Grubin, H.L.; Ferry, D.K.; Hess, K.; Iafrate, G.J. New York, NY; Plenum Press (1984). (CONF-820605—).

From World hydrogen energy conference; Pasadena, CA, USA (13 Jun 1982).

We have studied the radiation emitted by electron-bombarded silver particles. Electron micrographs have shown that the particles, obtained by heating thin (5 nm) silver films, were oblate (flattened) with minor axes aligned along the substrate normal. The characteristic wavelength obtained by bombarding these particles with 15 keV electrons was found to vary with angle of photon emission. We have modeled this wavelength shift as a result of the mixture of radiation from dipole and quadrupole surface plasmon oscillations on oblate spheriods. Experimental observations of the energy, polarization, and angular distribution of the emitted radiation are in good agreement with theoretical calculations.

30116 **Application of external forces to computational models of crystals.** Busing, W.R.; Matsui, M. (Oak Ridge National Lab., TN). *Acta Crystallographica, Section A: Crystal Physics, Diffraction, Theoretical and General Crystallography;* A40: 532-538(1984). Contract W-7405-ENG-26.

A computational model of a crystal consists of a description of the crystal structure, expressions for calculating the energy of the model in terms of this structure, and a way of minimizing this calculated energy with respect to the structural variables. External forces such as hydrostatic pressure, normal and shearing stresses, or electric fields can be simulated by adding a term to energy which describes the external energy of the force-producing device. Minimizing the total energy produces a structure distorted by the external force. From the calculated distortion it is possible to obtain the complete elastic tensor and the dielectric and piezoelectric constants of the crystal. Some phase changes can be simulated, and it should be possible to induce ferroelastic or ferroelectric transitions in the model. The effect of these forces on the orientation and conformation of molecules in the crystal can also be computed. 46 references, 2 figures, 1 table.

30117 **Sulfur diffusion in oxide grain boundaries.** Yang, F.C.; Whittle, D.P. (Univ. of California, Berkeley). *Corrosion Science;* **23**: No. 3, 285-290(1983). Contract AC03-76SF00098.

Nearly all fossil fuels contain sulfur as an impurity and when they are burned - whether in a turbine, in fluidized beds, or in conversion processes such as coal gasification or liquefaction - they generate atmospheres that contain sulfur compounds. As a consequence, the use of metallic alloys in such environments invariably leads to a breakaway phenomenon in which the oxide scale loses its protectiveness and unacceptably high rates of metal wastage ensue. Generally, the cause of the breakaway is related to sulfur penetration through the growing oxide scale, resulting in formation of sulfides both within and below the scale, although the detailed mechanism has not been unequivocally demonstrated. Pre-forming of the protective oxide in a sulfur-free atmosphere may delay the breakaway, but does not eliminate it. Mechanisms for sulfur transport through the oxide are discussed.

30118 **Mechanics and mechanisms of intergranular cavitation in creeping alloys.** Argon, A.S.; Chen, I.W.; Lau, C.W. (Massachusetts Institute of Technology, Cambridge). pp 23-49 of Three-dimensional constitutive relations and ductile fracture. Nemat-Nasser, S. (ed.). Amsterdam, Netherlands; North-Holland Publishing Co. (1980). Contract AC02-77ER04461.

From IUTAM symposium on three-dimensional constitutive relations and ductile fracture; Dourdan, France (2-5 Jun 1980).

The formation of grain-boundary cavities by vacancy aggregation in creeping alloys at elevated temperatures requires interface tensile stresses in excess of 5×10^{-3} E. Such high stresses can occur across the faces of grain-boundary particles during early phases of grain-boundary sliding with local power-law creep accommodation, provided that the particles are larger than a critical size and the applied stress is in excess of a threshold value. Thus, cavitation begins as soon as grain-boundary sliding begins. Continued cavity nucleation during creep is a result of the stochastic nature of grain-boundary sliding. Wedge cracks at triple grain junctions normally do not nucleate as a separate entity during creep, but instead result from accelerated cavity growth in response to concentrated tensile stresses that build up there as the shear traction on sliding boundaries is relaxed. Experimental detection of critical size cavities of c.a. 10^{-9} m on grain-boundary particles at or near the time of their nucleation is beyond the resolution of any present experimental technique. Therefore, cavity nucleation measurements having a size resolution at 10^{-7} m in crept 304 stainless steel reflect the kinetics of cavity growth rather than cavity nucleation.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 29167, 29459, 29520, 29526, 29527, 29529, 29530, 29531, 29532, 29533, 29534, 29535, 29536, 29539, 29544, 30110, 30116, 30190, 30227, 31040

30119 **(AECL—7821) Model for growth of beta-phase particles in zirconium-2.5 wt% niobium.** Chow, C.K.; Liner, Y.; Rigby, G.L. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Aug 1984. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900379.

Work performed under Canada/US Waste Management Information Exchange Agreement.

The kinetics of the $\alpha \rightarrow \beta$ phase change in Zr-2.5% Nb pressure-tube material at constant temperature have been studied. The volume-fraction change of the β phase due to diffusion in an infinite α-phase matrix was considered, and a mathematical model with a numerical solution was developed to predict the transient spherical growth of the β-phase region. This model has been applied to Zr-2.5% Nb, and the calculated results compared to experiment.

30120 **(CEA-CONF—8047) Hot isostatic pressing of ceramics.** Boncoeur, M.; Lieven, T.; Palacio, M.; Mandet, F. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Jun 1985. 31p. (In French). (CONF-8506249—1). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751334.

From Congress on shaping processes; Paris, France (25 Jun 1985).

Use of isostatic pressing at high temperature for ceramics is recent. The pros and cons for various materials concerned by this process. Different applications are briefly given to show importance of this process for the elaboration of high technology materials. One of them concerns radioactive waste storage.

30121 **(N—86-16269) Development of a continuous spinning process for producing silicon carbide - silicon nitride precursor fibers. Final report.** (Bjorksten Research Labs., Inc., Madison, WI (USA)). 1985. 43p. (NASA-CR—178458). NTIS, PC A03/MF A01.

An apparatus was designed for the continuous production of silicon carbide - silicon nitride precursor fibers. The precursor polymer can be fiberized, crosslined and pyrolyzed. The product is a metallic black fiber with the composition of the type C sub x Si sub y n sub z. Little, other than the tensile strength and modulus of elasticity, is known of the physical properties.

30122 **(N—86-16599) Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics.** Roth, D.J.; Baaklini, G.Y. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 36p. (NASA-TM—87222; E—2864; CONF-860152—3). NTIS, PC A03/MF A01.

From 10. annual conference on composites and advanced ceramic materials; Cocoa Beach, FL, USA (19 Jan 1986).

The reliability of 100 MHz scanning laser acoustic microscopy (SLAM) for detecting internal voids in sintered specimens of silicon nitride and silicon carbide was evaluated. The specimens contained artificially implanted voids and were positioned at depths ranging up to 2 mm below the specimen surface. Detection probability of 0.90 at a 0.95 confidence level was determined as a function of material, void diameter, and void depth. The statistical results presented for void detectability indicate some of the strengths and limitations of SLAM as a nondestructive evaluation technique for structural ceramics.

30123 **(N—86-17472) Effect of argon and hydrogen on deposition of silicon from tetrachlorosilane in cold plasmas.** Manory, R.R.; Avni, R.; Grill, A. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1985. 16p. (NASA-TM—87219; E—2820; CONF-851217—64). NTIS, PC A02/MF A01.

From Materials Research Society meeting; Boston, MA, USA (2 Dec 1985).

The roles of Ar and H_2 on the decomposition of $SiCl_4$ in cold plasma were investigated by Langmuir probes and mass spectrometry. Decomposition of the reactant by Ar only has been found to be very slow. In presence of H_2 in the plasma $SiCl_4$ is decomposed by fast radical-molecule reactions which are further enhanced by Ar due to additional ion-molecule reactions in which more H radicals are produced. A model for the plasma-surface interactions during deposition of mu-Si in the Ar + H_2 + $SiCl_4$ system is presented.

30124 **(ORNL/TM—9903) Corrosion of materials by high-temperature industrial combustion environments: a summary.** Federer, J.I. (Oak Ridge National Lab., TN (USA)). Feb 1986. Contract AC05-84OR21400. 59p. NTIS, PC A04/MF A01; GPO Dep. File Number DE86009995.

During the past 9 years, 23 ORNL reports described the effects of high-temperature industrial flue gas on ceramic materials and metallic alloys. This document summarizes those reports in a simple format for easy perusal. The materials include commercially available alumina, silica, and magnesia refractories; alumina and aluminosilicate refractory fiber insulations; silicon carbide ceramics; sialons; alumina ceramics; cordierite; and various iron-, nickel-, and cobalt- based alloys. Exposures occurred in industrial furnaces of the following types: coal-fired kiln, glass furnace, utility boiler, steel-soaking pit, heat-treating furnace, lime kiln, cement kiln, aluminum-remelt furnace, and steel-reheat furnace. Various chemical, thermal, and thermal-mechanical degradation mechanisms were identified. Degradation mechanisms in refractory oxides and oxide ceramics involved reactions with species in the combustion prod-

ucts, slags, and other deposits. Formation of new liquid, glassy, and solid phases resulted in loss of structural integrity. Destructive stresses associated with volume changes in the case of new solid phases were sometimes increased by thermal cycling. Degradation of ceramics was also caused by excessive temperatures, thermal cycling, and stresses caused by adhering slags and other materials. Several types of degradation mechanisms were observed in metallic alloys, including breakaway oxidation associated with excessive temperature, intergranular oxidation, and sulfidation-oxidation.

30125 **Subcritical crack growth in partially stabilized ZrO_2(MgO).** Becher, P.F. (Oak Ridge National Lab., TN, USA). *Journal of Materials Science;* 21: No. 1, 297-300(Jan 1986).

The room temperature slow crack growth resistance in air (approx. 50% relative humidity) and in water for large cracks in MgO-partially stabilized zirconia (PSZ) improves with increase in critical fracture toughness, Ksub(Ic). Ageing the as-fired PSZ at 1400°C for 8 h results in decreasing Ksub(Ic) from 8.5 MPa msup(1/2) to 6 MPa msup(1/2). The ageing treatment also promotes the growth of eutectoid decomposition products on grain boundaries that is accompanied by a decrease in the dependence of the change in Region 1 crack velocity with a change in the applied stress intensity. Calculated times to failures are markedly decreased in the aged as compared to the as-fired PSZ ceramic.

30126 **Silicon carbide whisker reinforced ceramic composites and method for making same.** Wei, G. C. (to The United States of America as represented by the Department of Energy). US Patent 4,543,345. 24 Sep 1985. Filed date 9 Feb 1984. vp.

PAT-APPL-578407.

The present invention is directed to the fabrication of ceramic composites which possess improved mechanical properties especially increased fracture toughness. In the formation of these ceramic composites, the single crystal SiC whiskers are mixed with fine ceramic powders of a ceramic material such as Al_2O_3, mullite, or B_4C. The mixtures which contain a homogeneous dispersion of the SiC whiskers are hot pressed at pressures in a range of about 28 to 70 MPa and temperatures in the range of about 1600° to 1950° C. with pressing times varying from about 0.75 to 2.5 hours. The resulting ceramic composites show an increase in fracture toughness of up to about 9 MPa.m /SUP 1/2/ which represents as much as a two-fold increase over that of the matrix material.

30127 **Pressurized heat treatment of glass-ceramic to control thermal expansion.** Kramer, D. P. (to The United States of America as represented by the Department of Energy). US Patent 4,536,203. 20 Aug 1985. Filed date 19 Apr 1984. vp.

PAT-APPL-602035.

A method of producing a glass-ceramic having a specified thermal expansion value is disclosed. The method includes the step of pressurizing the parent glass material to a predetermined pressure during heat treatment so that the glass-ceramic produced has a specified thermal expansion value. Preferably, the glass-ceramic material is isostatically pressed. A method for forming a strong glass-ceramic to metal seal is also disclosed in which the glass-ceramic is fabricated to have a thermal expansion value equal to that of the metal. The determination of the thermal expansion value of a parent glass material placed in a high-temperature environment is also used to determine the pressure in the environment.

30128 **Ceramic-glass-metal seal by microwave heating.** Meek, Th. T.; Blake, R. D. (to The United States of America as represented by the Department of Energy). US Patent 4,529,856. 16 Jul 1985. Filed date 4 Oct 1983. vp.

PAT-APPL-538889.

A method for producing a ceramic-glass-metal seal by microwaving mixes a slurry of glass sealing material and coupling agent and applies same to ceramic and metal workpieces. The slurry and workpieces are then insulated and microwaved at a power, time and frequency sufficient to cause a liquid phase reaction in the slurry. The reaction of the glass sealing material forms a chemically different seal than that which would be formed by conventional heating because it is formed by diffusion rather than by wetting of the reactants.

30129 **Ceramic-glass-ceramic seal by microwave heating.** Meek, Th. T.; Blake, R. D. (to The United States of America as represented by the Department of Energy). US Patent 4,529,857. 16 Jul 1985. Filed date 4 Oct 1983. vp.

PAT-APPL-538890.

A method for producing a ceramic-glass-ceramic seal by microwaving, mixes a slurry of glass sealing material and coupling agent and applies same to ceramic workpieces. The slurry and workpieces are placed together, insulated and then microwaved at a power, time and frequency sufficient to cause a liquid phase reaction in the slurry. The reaction of the glass sealing material forms a chemically different seal than that which would be formed by conventional heating because it is formed by a diffusion rather than by wetting of the reactants.

30130 **Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration.** Caputo, A.J.; Lackey, W.J.; Stinton, D.P. (Metals and Ceramics Div., Oak Ridge National Lab., Oak Ridge, TN 37831). pp 694-706 of Proceedings of the ninth annual conference on composites and advanced ceramic materials. Columbus, OH; American Ceramic Society, Inc. (1985). (CONF-850122—). Contract AC05-84OR21400.

From 9. annual conference on composites and advanced ceramic materials and workshop on testing methods for ceramic matrix composites; Cocoa Beach, FL, USA (20 Jan 1985).

A new, faster process was developed for the fabrication of ceramic fiber-reinforced, ceramic-matrix composites by chemical vapor infiltration. Process and equipment improvements led to the fabrication of preforms with a higher fiber content, and infiltration improvements led to reduced infiltration run times and increased infiltrated densities. These improvements have produced composites with not only higher flexural strengths, but also high strain values. The high strain values have been a goal of this work.

30131 **Simultaneous chemical vapor deposition of SiC-dispersed phase composites.** Stinton, D.P.; Lackey, W.J. (Metals and Ceramics Div., Oak Ridge National Lab., Oak Ridge, TN 37831). pp 707-713 of Proceedings of the ninth annual conference on composites and advanced ceramic materials. Columbus, OH; American Ceramic Society, Inc. (1985). (CONF-850122—). Contract AC05-84OR21400.

From 9. annual conference on composites and advanced ceramic materials and workshop on testing methods for ceramic matrix composites; Cocoa Beach, FL, USA (20 Jan 1985).

Ceramic composites are being developed because they can have high strength and toughness yet retain the normal ceramic attributes of refractoriness and high resistance to abrasion and corrosion. In the present research, toughened ceramic composites were produced by the simultaneous chemical vapor deposition of an SiC matrix and a dispersed phase of $TiSi_2$. The morphology of the dispersed phase was found to control the mechanical properties of the composite. Deposition of coatings in a fluidized bed produced a finer and more uniformly dispersed second phase. The conditions within the fluidized bed, such as temperature, gas composition, and hydrogen flow also affected the morphology of the $TiSi_2$ phase. The fracture toughness values for these composite coatings approached 5.5 MPa$\sqrt{m}$ at 25°C, which is significantly higher than the toughness value for chemically vapor-deposited SiC.

30132 **Processing and microstructural characterization of B_4C-Al cermets.** Halverson, D.C.; Pyzik, A.J.; Aksay, I.A. (Lawrence Livermore National Lab., Livermore, CA 94550). pp 736-744 of Proceedings of the ninth annual conference on composites and advanced ceramic materials. Columbus, OH; American Ceramic Society, Inc. (1985). (CONF-850122—).

From 9. annual conference on composites and advanced ceramic materials and workshop on testing methods for ceramic matrix composites; Cocoa Beach, FL, USA (20 Jan 1985).

Reaction thermodynamics and wetting studies were employed to evaluate boron carbide-aluminum cermets. Wetting phonomenon and interfacial reactions are characterized using "macroscale" and "microscale" techniques. Macroscale evaluation involved aluminium sessile drop studies on boron carbide substrates. Micros-

cale evaluation involved the fabrication of actural cermet microstructures and their characterization through sem, x-ray diffraction, metallography, and electron microprobe. Contact-angle measurements and interfacial-reaction products are reported.

30133 Fracture toughness of $MgCr_2O_4$-ZrO_2 composities. Singh, J.P. (Materials Science and Tech. Div., Argonne National Laboratory, Argonne, IL 60439). pp 729-735 of Proceedings of the ninth annual conference on composites and advanced ceramic materials. Columbus, OH; American Ceramic Society, Inc. (1985). (CONF-850122—).

From 9. annual conference on composites and advanced ceramic materials and workshop on testing methods for ceramic matrix composites; Cocoa Beach, FL, USA (20 Jan 1985).

The effect of unstabilized ZrO_2 inclusions on the fracture surface energy of $MgCr_2O_4$ was studied as a function of ZrO_2 content. It was observed that fracture surface energy increases with increasing ZrO_2 content, and reaches the maximum value of 24.5 j/m^2 at 16.5 vol% ZrO_2. This represents an $\approx$ fourhold increase in the fracture surface energy of $MgCr_2O_4$ as a result of ZrO_2 inclusions. It is proposed that this improvement results from the energy absorbed by the microcracks formed in the $MgCr_2O_4$ matrix as a result of the tetragonal $\rightarrow$ monoclinic phase transormation of ZrO_2 and the associated volume expansion.

30134 Screening ceramic materials for intense radiant heat applications. Holmes, J.T.; Edgar, R.M.; Gerrish, P.F. (Sandia National Lab., Albuquerque, NM 87185). pp 862-867 of Proceedings of the ninth annual conference on composites and advanced ceramic materials. Columbus, OH; American Ceramic Society, Inc. (1985). (CONF-850122—). Contract AC04-76DP00789.

From 9. annual conference on composites and advanced ceramic materials and workshop on testing methods for ceramic matrix composites; Cocoa Beach, FL, USA (20 Jan 1985).

More than 100 commercially available ceramic fiber, board, blanket, and cloth materials have been evaluated for use in high-intensity sunlight or other radiant-heat environments. The failure of these materials depends on their reflectivity, emissivity, and light-scattering properties and cannot be predicted by their temperature rating.

30135 Partial structure-field map for $A^{3+}B^{5+}O_4$ compounds. Aldred, A.T. (Argonne National Lab., IL). *Materials Letters;* 3: No. 1-2, 37-39(Nov 1984).

The occurrence of crystal-structure types among a series of ANb/sub 1-x/ V/sub x/O_4 compounds, where A is a trivalent rare-earth ion, has been determined by X-ray diffraction. The results have been used to refine the published structure-field map for $A^{3+}B^{5+}O_4$ compounds. Discrete regions of stability are found for the monazite, zircon, fergusonite and scheelite structures. 9 references, 2 figures.

30136 Reduction of substrate interference in Raman spectroscopy of submicron titania coatings. Hsu, L.S.; She, C.Y.; Exarhos, G.J. (Pacific Northwest Lab., Richland, WA). *Applied Optics;* 23: No. 18, 3049-3051(15 Sep 1984).

Recent interests in low-loss and low-scatter optical coatings have generated a need for structural characterization of submicron dielectric films on a substrate. Conventional x-ray diffraction works well only for thick films; its required long measurement time, typically hours, leaves much to be desired. Recently, using Raman spectroscopy in a 180° backscattering geometry, Pawlewicz et al. were able to characterize crystalline single-layer optical dielectric coatings with a measurement time a factor of 100 less than that required for the conventional method of x-ray diffraction. The authors concluded that the minimum thickness for single-layer Raman spectroscopy of TiO_2 anatase coatings on silica substrates is $\sim$ 125 nm and that for thinner coatings, the more sensitive interference-enhanced Raman scattering technique, should be used. This latter technique requires that the coating under investigation be deposited as the top layer of a specially prepared trilayer structure with a reflecting substrate and thus would require a modification to the original coating. The single-layer technique is a direct method and is more desirable if its sensitivity can be improved.

30137 Diffusion mechanisms in transition-metal oxides. Peterson, N.L. (Argonne National Lab., IL). *Materials Research Society Symposia Proceedings;* 24: 15-25(1984).

Results are presented for cation self-diffusion in Cu_2O and Cr_2O_3 as a function of temperature and deviation from stoichiometry. A defect model for Cu_2O involving neutral and singly charged copper vacancies, electron holes, and singly charged oxygen-interstitial ions is developed and fit to the tracer-diffusion data, the electrical-conductivity data, and the stochiometry data yielding concentrations and mobilities of these defects. The diffusion results for Cr_2O_3 single crystals indicate that cation self-diffusion takes place by triply charged vacancies and that previous diffusion results for polycrystalline Cr_2O_3 are dominated by grain-boundary diffusion. 25 references, 5 figures.

30138 Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds. Nevitt, M.V.; Aldred, A.T. (Argonne National Lab., IL). *ACS Symposium Series;* No. 246, 315-321(1984).

From 185. meeting of the American Chemical Society; Seattle, WA, USA (20-25, Mar 1983).

X-ray diffractometry measurements were made as a function of temperature on a series of polycrystalline LaV/sub x/Nb/sub 1-x/O_4 compounds ($0 < x < 0.3$) to determine the effect of V substitutions on the temperature of the monoclinic/tetragonal transformation. The purpose was to provide basic information relating to crystal lattice stability in ABO_4 compounds that are either candidates or are appropriate models for candidate materials for hosting nuclear waste ions. Partial substitution of V^{5+} on the Nb^{5+} site significantly lowers the tetragonal scheelite ($I4_1/a$) to monoclinic fergusonite (I2/c) transformation, from 770 K in $LaNbO_4$ to approximately 215 K for LaV/sub 0.25/Nb/sub 0.75/O_4 (the solubility limit is close to $x = 0.35$). The transformation is displacive, of second order, involving two coupled order parameters. Heat capacity measurements on LaV/sub 0.25/Nb/sub 0.75/O_4 showed that the specific heat anomaly at the transformation point is extremely small. It is concluded that the two polymorphic forms of LaV/sub x/Nb/sub 1-x/O_4 have very nearly the same free energies over a substantial range of temperature below the transformation. 12 references, 3 figures.

30139 Diffusion and point defects in Cu_2O. Peterson, N.L.; Wiley, C.L. (Argonne National Lab., IL). *Journal of Physics and Chemistry of Solids;* 45: No. 3, 281-294(1984).

The diffusion of ^{64}Cu in Cu_2O has been measured by a serial-sectioning technique as a function of temperature (700-1153°C) and oxygen partial pressure (10^{-6}-8 x 10^{-2} atm). The oxygen-partial-pressure and temperature dependencies of D/sub Cu/* suggest that both neutral and singly charged copper vacancies contribute to cation self-diffusion. A defect model involving both neutral and singly charged copper vacancies, electron holes, and singly charged oxygen-interstitial ions is developed and fit to the tracer-diffusion data, the electrical-conductivity data and the stoichiometry data. The resulting defect data are quantitatively consistent with the chemical-diffusion data and with a correlation factor f/sub v/ = 2/3. The defect data are also quantitatively consistent with the high-temperature oxidation studies of copper metal and with the copper vacancy being 10 times more mobile than the oxygen-interstitial ion at 1000°C. 22 references, 10 figures, 2 tables.

30140 Crystal growth and properties of trinickel boride, Ni_3B. Finch, C.B.; Cavin, O.B.; Becher, P.F. (Oak Ridge National Lab., TN). *Journal of Crystal Growth;* 67: 556-558(1984). Contract W-7405-ENG-26.

Single crystals of Ni_3B (orthorhombic, cementite structure) were grown by the Czochralski method at 1080-1090°C, using a pyrolytic BN crucible in a vacuum environment. Crystals up to 1.5 cm in diameter and 5 cm long were prepared at growth rates of 1-2 cm/h. Oriented sections were tested for hardness, Young's moduli, and fracture toughness. Chemical analyses confirmed the crystals to be > 99.8 wt% Ni_3B, with 0.1 wt% C as the major impurity. 7 references, 1 figure, 3 tables.

30141 **Secondary fluorescence effects on x-ray microanalysis.** Angelini, P.; Bentley, J. (Oak Ridge National Lab., TN). *Proceedings - Annual Meeting, Electron Microscopy Society of America;* 42: 582-583(1984). Contract AC05-84OR21400.

The structure and composition of intergranular phases present in TiB_2 hot-pressed or sintered with Ni additive are being analyzed to evaluate sintering mechanisms. Analytical electron microscopy (AEM) has shown that the major intergranular phase present in TiB_2 hot-pressed with Ni is Ni_3B, but in TiB_2 sintered with Ni is a boride tau phase. Energy dispersive x-ray spectroscopy (EDS) of the intergranular Ni_3B indicated a Ti content of ~ 8 at. % (all compositions quoted are normalized where at % Ti + at % Ni = 100%). However, phase diagram data show Ni_3B to be a line compound with limited Ti solubility. The experiments were performed to assess the suspected influence of secondary fluorescence effects on EDS analyses.

30142 **Accuracy of the linear gradient approximation for diffusion-controlled growth of iron sulfide.** Pawel, R.E. (Oak Ridge National Lab., TN). *Oxidation of Metals;* 19: No. 1/2, 19-25(1983). Contract W-7405-ENG-26.

The growth of a defective scale is analyzed in terms of an idealized, single-layer, moving-boundary problem with constant diffusivity. The form of the solution is chosen to emphasize the magnitude of the departure from a linear concentration gradient of the diffusing species in the growing scale. The departure is shown to be a function of the k/sub p/D ratio (where k/sub p/ is the parabolic rate constant, and D is the chemical diffusivity), and thus is directly related to the defect concentration. For iron sulfide under most conditions, and for other compound scales with defect concentrations less than about 10%, the linear gradient assumption is shown to be reasonable. 10 references, 1 figure.

3603 Composite Materials

30143 **(CONF-860413—1) Chemical vapor infiltration of fiber-reinforced ceramic composites.** Stinton, D.P.; Caputo, A.J.; Lowden, R.A.; Besmann, T.M. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 8p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009513.

From 2. international symposium on ceramic materials and components for engines; Luebeck-Travemuende, F.R. Germany (14 Apr 1986).

A process has been developed for the fabrication of fiber-reinforced SiC composites by chemical vapor infiltration. Infiltration times for the low-density fibrous structures were reduced significantly from previous processes by simultaneously utilizing a thermal gradient and forced gas flow. Uniform matrix deposition occurred throughout unidirectional-fiber, cloth, or random chopped-fiber preforms to produce composites with densities approaching 90% of theoretical. Fabrication of composites in this fashion produced specimens with high flexural strengths and with a strain at maximum load which significantly exceeded those of conventional SiC bodies.

30144 **(N—86-17477) Specimen geometry effects on graphite/PMR-15 composites during thermo-oxidative aging.** Bowles, K.J.; Meyers, A. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1986. 19p. (NASA-TM—87204; E—2860; CONF-860438—3). NTIS, PC A02/MF A01.

From 31. national symposium and exhibition of the Society for the Advancement of Material and Process Engineering; Las Vegas, NV, USA (8 Apr 1986).

Studies were conducted to establish the effects of specimen geometry on the thermo-oxidative stability and the mechanical properties retention of unidirectional Celion 12000 graphite fiber reinforced PMR-15 polyimide composites. Weight loss, flexural strength and interlaminar shear strength are measured at isothermal aging times as long as 1639 hr at a temperature of 316 C for three different specimen geometries. It is found that the three different types of specimen surfaces exhibit different values of weight loss/unit area. The mechanical properties retention is also found to be dependent on geometry for these composites. The interlaminar shear strength decreases significantly over the compiete range of aging times. The flexural strength retention starts showing geometric dependency after about 1000 hr of aging at 316C. Weight loss fluxes, associated with the three different types of exposed surfaces, are calculated and used to develop an empirical mathematical model for predicting the weight loss behavior of unidirectional composites of arbitrary geometries. Data are presented comparing experimentally determined weight loss with weight loss values predicted using the empirical model.

3604 Polymers And Plastics

30145 **(N—86-17476) Effects of high energy radiation on the mechanical properties of epoxy-graphite fiber reinforced composites. Interim report, 1 January- 31 December 1985.** Fornes, R.E.; Gilbert, R.D.; Memory, J.D. (North Carolina State Univ., Raleigh (USA)). Dec 1985. 263p. NTIS, PC A12/MF A01.

In an effort to elucidate the changes in molecular structural and mechanical properties of epoxy/graphite fiber composites upon exposure to ionizing radiation in a simulated space environment, spectroscopic and surface properties of tetraglycidyl-4,4'-diamino diphenyl methane (TGDDM) red with diamino diphenyl sulfone (DDS) and T-300 graphite fiber were investigated following exposure to ionizing radiation. Cobalt-60 gamma radiation and 1/2 MeV electrons were used as radiation sources. The system was studied using electron spin resonance (ESR) spectroscopy, infrared absorption spectroscopy, contact angle measurements, and electron spectroscopy for chemical analysis.

30146 **Correlation networks in polymeric materials determined by small-angle neutron scattering.** Sperling, L.H.; Fernandez, A.M.; Wignall, G.D. (Lehigh Univ., Bethlehem, PA). *ACS Symposium Series;* No. 243, 71-89(1984).

From 185. meeting of the American Chemical Society; Seattle, WA, USA (20-25, Mar 1983).

Two nonclassical methods of aggregation as detected by small-angle neutron scattering, SANS, are examined. In one case, deuteropolyethylene separates from polyethylene on slow cooling from the melt, because of a six degree difference in their melting temperatures. In the second case, polystyrene crosslinked with divinyl benzene was examined. The network had a delta fraction of deuterated polystyrene inserted at various points in the reaction via a substitution method. Both cases of aggregation were shown to fit the Schelten correlation network concept, where no real center of mass motion takes place. For the polystyrene-DVB network case, the SANS experiments make it possible to distinguish networks formed during the polymerization from those vulcanized after polymerization is complete. 29 references, 7 figures, 5 tables.

3606 Other Materials

REFER ALSO TO CITATION(S) 29313, 29359, 29373, 29409, 29420, 29427, 29552, 29553, 29556, 29556, 29557, 29558, 30116, 30127, 30145, 30388, 30472, 30473, 30474, 30495, 30526

30147 **(AECL—7805) Thermal properties of clay-based buffer materials for a nuclear fuel waste disposal vault.** Radhakrishna, H.S. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Jun 1984. 61p. NTIS (US Sales Only), PC A04/MF A01. File Number DE84901835.

Work performed under Canada/US Waste Management Information Exchange Agreement.

The thermal properties of three types of bentonite clay, one illite-rich shale and one kaolin mixed with crushed granite were investigated. Thermal conductivity measurements were made over a range of mix proportions, moisture content, density and ambient temperature using the transient heat-probe method. The effects of thermal drying in the buffer zone prior to water uptake were investigted by means of laboratory-scale heater experiments. Illite-rich shale (Sealbond) and kaolin exhibited better compactability and thermal conductivity than the bentonite clays. The thermal conductivity of all types of clay buffers showed a high degree of moisture dependency and relatively no effect due to elevated temperature

under high fluid pressure conditions. Bentonite buffers compacted to a dry density of 1200 to 1400 kg/m³ showed extensive cracking due to differential shrinkage. Addition of crushed granite, and/or compaction to a higher density, reduced the thermal cracking of the buffer material. 11 refs., 31 figs., 9 tabs.

30148 **(AECL—8366) Effect of pH on the stability of smectite.** Johnston, R.M.; Miller, H.G. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Nov 1984. 50p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900685.

The hydrothermal stability of smectite at temperatures less than 275°C was investigated experimentally over a range of pH values. In the near-neutral pH region, the smectite to illite conversion predominated; in the mildly acid region, there was extensive formation of aluminum hydroxy interlayers in the clay; and in the alkaline region, framework silicates (feldspar and zeolites) were produced. The geological evidence for these reactions is also reviewed.

30149 **(AECL—8376) Hydrothermal stability of bentonite-based buffer materials.** Johnston, R.M.; Miller, H.G. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Feb 1985. 74p. NTIS (US Sales Only), PC A04/MF A01. File Number DE85901220.

Work performed under Canada/US Waste Management Information Exchange Agreement.

The reactions expected in bentonite-based buffer materials under conditions tyical of a nuclear fuel waste disposal vault include mineral transformations (e.g. smectite to illite; smectite to zeolite) and a range of low-temperature cementation reactions. The probable extent and significance of these reactions are reviewed, and other reactions involving proposed filler sands are also examined briefly. The effects of mineral transformations on buffer performance will be insignificant if disposal vault temperatures do not exceed 100 to 200°C and pH remains in the range 4 to 8. At pH > 9, zeolitization and silica dissolution may occur and buffer stability cannot be assured. The effects of cementation reactions may be significant, but are difficult to predict and require further investigation.

30150 **(CEA-CONF—7892) Activation energies of recovery of the oxide charge created by ionizing pulse, energies being taken related to room temperature during irradiation and related to process oxidation temperature.** Leray, J.L.; Gris, Y. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Apr 1985. 9p. (In French). (CONF-8504212—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751590.

From Insulating films on semiconductors congress (INFO 85); Toulouse, France (16 Apr 1985).

Experimental MOS/SS I transistors have been irradiated. Threshold voltage has been followed after a pulsed ionizing irradiation (10-30 k rads) at different temperatures (-198, -77, -28, 23, 100°C). The recovery curve shape allows to define parameters (recovery time). The final time of recovery is thermally activated. Energies of around 0,7 eV related to room temperature are found, and those energies are function of oxidation temperature (850, 900, 950, 1000°C) of transistor grid oxide. Consequences on structural properties of silicon oxide and of its interface with silicon are deduced.

30151 **(CEA-CONF—8079) Global methods for reinforced concrete slabs.** Hoffmann, A.; Lepareux, M.; Combescure, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Aug 1985. 16p. (CONF-8508166—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751606.

From IUTAM symposium on inelastic behavior of plates and shells; Rio de Janeiro, Brazil (5 Aug 1985).

This paper develops the global method strategy to compute elastoplastic thin shells or beams. It is shown how this methodology can be applied to the case of reinforced concrete structures. Two cases of applications are presented: one static, the other dynamic. The numerical results are compared to experimental data.

30152 **(CEA-CONF—8123) Electronic structure of the uranium(IV)-tetrakis-1,1,1-trifluoro-4-phenylbutane-2,4-dionato: magnetochemical study.** Blaise, A.; Genet, M.; Song, C.L.; Soulie, E. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1985. 13p. (In French). (CONF-8509147—15). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751335.

From ACTINIDES '85; Aix-en-Provence, France (1 Sep 1985).

The parallel and perpendicular magnetic susceptibilities of a single crystal of $U(tfba)_4$ have been measured in the temperature range 8-300 K, using a SQUID system magnetometer. In this compound, the U atom lies in a S_4 point-symmetry site and the crystal-field (CF) on the $Rn[5f]^2$ ion is characterized by 7 parameters (CFP). The weak anisotropy of the measured susceptibility suggests that the CF is not very different of a cubic field. The crystal field parameters are adjusted in order to account for the thermal variations of magnetic susceptibilities by the Van Vleck formula. The starting values of the CFP are taken as for cubic symmetry. A set of CFP and thus the energy levels of the CF is obtained which gives a reasonable agreement between observed and calculated values of magnetic susceptibilities. 10 references are given.

30153 (CONF-850314—Vol.2, pp 201-204) **Alternative sealing materials for radioactive waste longterm storage or disposal.** Uetake, Naohito; Fukasawa, Tetsuo; Kawamura, Fumio; Yusa, Hideo. (Hitachi Ltd., Japan). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The properties of Ca_3SiO_5-sodium silicate solution system solids were investigated for potential use in sealing radioactive waste. Preliminary experimental results showed that after autoclaving the solids had a high strength comparable to concrete while their ability to immobilize radioactive nuclides was better than concrete. Additionally, these solids were expected to offer superior chemical stability during the long periods required for safe radioactive waste storage and disposal. Based on these results, the Ca_3SiO_5-sodium silicate solution system can be considered as a good alternative sealing material.

30154 (CONF-850314—Vol.2, pp 369-375) **Degradation of resins in EPICOR-II prefilters from Three Mile Island.** McConnell, J.W. Jr.; Sanders, R.D. Sr. (EG and G Idaho, Inc., Idaho Falls). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Low-Level Waste Data Base Development - EPICOR-II Resin/Liner Investigation Project funded by the US Nuclear Regulatory Commission examining the chemical and physical conditions of the synthetic ion exchange resins found in several EPICOR-II prefilters. This paper summarizes results and analyses of the first sampling of ion exchange resins from EPICOR-II prefilters PF-8 and -20. Results are compared with baseline data from tests performed on unirradiated EPICOR resins to determine if degradation has occurred due to the high internal dose received by the resins.

30155 **(FRNC-TH—2131) Pressure and irradiation effects on transport properties of samarium compounds with instable valence.** Morillo, J. (Paris-11 Univ., 91 - Orsay (France)). 1981. 266p. (In French). NTIS (US Sales Only), PC A12/MF A01. File Number DE86751322.

Electron transport properties in samarium compounds with instable valence are studied in this thesis: from SmS in its integer valence phases at common pressure to SmB_6 compound IV at common pressure through SmSsub(1 - x)Psub(x) (x <= 5%) compounds with inhomogeneous instable valence whose instability increases with phosphorus concentration, the main work concerning SmS. It is tried to precise the role played by the impurities and then to deduce the intrinsic character of those properties. The specific known properties of compound IV and more particularly of Samarium compounds are recalled. The electric conductivity of

SmS and SmSsub(1 - x)Psub(x) (x <= 5%) is studied related to temperature (T<400K). The pressure influence on transport properties (conductivity, Hall coefficient and transverse magnetoresistance) of SmS (in its semiconductor phase as well as in its intermediate valence phase) is also studied. Phase diagram (P,T) of SmS, got for T < 360K, is presented. Defects, influence induced by energetic particle irradiation (electrons, fast neutrons of around MeV energies) on electric conductivity of SmS, SmSsub(1 - x)Psub(x) (x <= 4%) and SmB_6 is presented.

30156 (INIS-mf—10073, pp THU-4.7) **Comparison of Auger recombination in GaInAs-AlInAs multiple quantum well structure and in bulk GaInAs.** Sermage, B.; Chemla, D.S.; Sivco, D.; Cho, A.Y. (AT and T Bell Laboratories, Holmdel, NJ, USA; AT and T Bell Laboratories, Murray Hill, NJ, USA). 1985. NTIS (US Sales Only), PC A07/MF A01. File Number DE86701485. (CONF-850774—).

From International conference on hot electrons; Innsbruck, Austria (8 Jul 1985).

30157 (INIS-mf—10098, pp 33) **Studies of defects with the Moessbauer effect.** Kolk, B. (University of the Witwatersrand, Johannesburg, South Africa. Dept. of Physics). 1984. NTIS (US Sales Only), PC A03/MF A01. File Number DE86780445. (CONF-8407145—Absts.).

From 19. annual seminar on theoretical physics; Cape Town, South Africa (9 Jul 1984).

30158 (INIS-mf—10098, pp 32) **Defects in solids studied by optical techniques.** Allen, A.M.T.; Comins, J.D.; Ford, P.J.; Lowther, J.E.; Ngoepe, P.E. (University of the Witwatersrand, Johannesburg, South Africa. Dept. of Physics). 1984. NTIS (US Sales Only), PC A03/MF A01. File Number DE86780445. (CONF-8407145—Absts.).

From 19. annual seminar on theoretical physics; Cape Town, South Africa (9 Jul 1984).

30159 **(INIS-mf—10098) Defect solid state '84. Programme and abstract booklet.** (South African Inst. of Physics, Faure; South African Chemical Inst., Johanneburg). 1984. 41p. (CONF-8407145—Absts.). NTIS (US Sales Only), PC A03/MF A01. File Number DE86780445.

From 19. annual seminar on theoretical physics; Cape Town, South Africa (9 Jul 1984).

Separate abstracts were prepared for each of the included papers. (MOW)

30160 **(LA-UR—86-1202) Transient absorption of light induced by radiation.** Godwin, R.; Harrison, F.B.; Larson, A. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-851052—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010173.

From 17. annual symposium on optical materials for high-power lasers; Boulder, CO, USA (28 Oct 1985).

We have measured two components in the radiation-induced absorption of 250-nm light in fused silica. For the first, the time constant is 48.3 +- 1.3 ns and the absorption coefficient is 6.68 +- 0.37 cm^{-1} per Mrad. For the second, the time constant is long compared to 3 μs, and the absorption coefficient is 1.65 +- 0.36 cm^{-1} per Mrad. The errors quoted are purely statistical.

30161 **(LBL—21214) Thermal and ion-assisted reactions of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine.** Balooch, M.; Olander, D.R.; Siekhaus, W.J. (Lawrence Berkeley Lab., CA (USA); Lawrence Livermore National Lab., CA (USA)). Mar 1986. Contract AC03-76SF00098. 9p. (CONF-860445—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009925.

From Materials Research Society spring meeting; Palo Alto, CA, USA (15 Apr 1986).

Reaction of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine was studied with and without simultaneous bombardment by energetic argon ions. The reaction products signals were measured as functions of surface temperature. For the purely thermal reactions, the main products below 600°K were $AlCl_3$, $AsCl_3$ and $GaCl_3$. The etching rates were two orders of magnitude lower than those of pure GaAs. With simultaneous ion bombardment, the reaction product signal of $AsCl_3$ at room temperature increased by almost a factor of four over the corresponding thermal reaction signal. The comparable enhancement factor for pure GaAs was ~6.

30162 **(NUREG/CR—3965) Investigation of the strength of H440 graphite when subjected to combined primary and secondary stress.** Anderson, C.A.; Fly, G.W.; Lundberg, L.B.; Romero, J.A. (Los Alamos National Lab., NM (USA)). Apr 1986. Contract W-7405-ENG-36. 78p. (LA—10652-MS). NTIS, PC A05/MF A01 - GPO. File Number TI86009816.

An experimental and analytical investigation of the strength of a fine-grained graphite, H440, under combined mechanical and thermal stress is described. Small sample laboratory tests were carried out to establish a mechanical property data base from which statistical parameters could be determined and then used in finite element codes for predicting failure probabilities of large graphite structural components under load. The theory was applied to graphite rings under an imposed thermal stress from a heat flux applied to the inner surface of the rings and under mechhanical stress caused by diametrically opposed concentrated loads applied to the outer surface of the rings. Rings of H440 graphite were fabricated in two sizes and tested to the combined thermal and mechanical loadings. From the results of theory and the experiments, a design rule for combining mechanical and thermal stress in graphite structural components is proposed.

30163 **(SAND—85-2446C) Solution chemistry of silicate and borate materials.** Bunker, B.C. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 8p. (CONF-860445—7). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009851.

From Materials Research Society spring meeting; Palo Alto, CA, USA (15 Apr 1986).

Reactions which create and destroy Si-O-Si, Si-O-B, and B-O-B bonds occur in leached layers on borosilicate glasses during glass dissolution. Solid state NMR, Raman, and TEM techniques have been used to determine the distribution of species formed in leached layers as a function of solution pH and the mechanisms of glass-water reactions. The chemical principles which govern the reactivity of silicate and borate bonds in leached layers appear to be similar to those which govern the formation of silicate and borate gels via sol-gel techniques.

30164 **(SAND—86-0065) Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material.** Merrill, R.M.; McCarthy, J.P.; Antepenko, R.J. (Sandia National Labs., Albuquerque, NM (USA); Monsanto Research Corp., Miamisburg, OH (USA). Mound; General Electric Co., Largo, FL (USA). Neutron Devices Dept.). Apr 1986. Contract AC04-76DP00789. 43p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86010309.

Silicate glass properties such as thermal coefficient of expansion, and molten viscosity can be altered by changing the formulation. One glass, called S-glass ceramic, and hereafter denoted simply as S-glass, has been specifically designed to be crystallized to a glass ceramic with a coefficient of expansion that matches Inconel 718, and has a molten viscosity low enough to flow into tight configurations without the formation of voids or bubbles. Since the glass must meet rigorous chemical and mechanical specifications, samples from each batch or lot have been chemically analyzed. A major difficulty in these analyses has arisen from a lack of suitable standards. NBS has several silicate glasses certified as standard reference materials; however, none of them contains all of the constituents present in S-glass, and for some of the constituents no standard exists which has a certified value close to the levels present in S-glass. For these reasons, it was decided that one complete melt of S-glass would be extensively analyzed by several different laboratories and dedicated for use as a reference standard. The batch's melting history was closely monitored, and the starting materials were well characterized. 2 refs., 3 figs., 9 tabs.

30165 **Dislocation reduction in epitaxial GaAs on Si (100).** Fischer, R.; Neuman, D.; Zabel, H.; Morkoc, H.; Choi, C.; Otsuka, N. (University of Illinois at Urbana-Champaign, 1101 West Springfield Avenue, Urbana, Illinois 61801). *Applied Physics Letters;* **48**: No. 18, 1223-1225(5 May 1986). Contract AC02-76ER01198.

We have studied the nucleation and propagation of threading dislocations in GaAs on Si epitaxial layers, and have found several techniques which are effective in reducing their density. The use of substrates properly tilted off (100) reduces the dislocation density as the presence of steps helps create perfect edge dislocations with their Burgers vector parallel to the interface and thus do not propagate into the bulk epitaxial layer. Cross sections by transmission electron microscopy show that the incorporation of an InGaAs/GaAs strained-layer superlattice reduces the density of threading dislocations above it by a factor of 10, clearly demonstrating the effectiveness of this technique. These methods lead to a dislocation density of 10^8 cm^{-2} near the surface of 2 μm layers which is five orders of magnitude lower than what has been obtained previously. We have also found that the density of oval defects is much lower for GaAs on Si than for GaAs on GaAs.

30166 **Neutral impurity scattering in AlGaAs.** Drummond, T.J.; Hjalmarson, H.P. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters;* **48**: No. 17, 1144-1146(28 Apr 1986). Contract AC04-76DP00789.

In the alloy system AlGaAs, a crossover from a direct (Γ) to an indirect (X) conduction-band minimum occurs when the AlAs mole fraction approaches 0.45. For AlAs mole fractions greater than about 0.2, the ground-state energy of substitutional donors becomes deep relative to the direct minimum. The donor level achieves a maximum depth of 0.16 eV near the crossover and it is not uncommon to find the donor impurity concentration exceeding the free-electron concentration by a factor of 10 at room temperature and a factor of 20 at lower temperatures. For large impurity to electron ratios and doping levels on the order of $10^{18}/cm^3$, neutral impurity scattering proves to be the dominant scattering mechanism at all temperatures.

30167 **Structural transitions and metallization in compressed solid argon.** McMahan, A.K. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Physical Review [Section] B: Condensed Matter;* **33**: No. 8, 5344-5349(15 Apr 1986). Contract W-7405-ENG-48.

Total-energy calculations are reported for compressed solid Ar which suggest that the observed 1-atm fcc phase should transform to an hcp structure prior to metallization, and it in turn should transform to a bcc structure at pressures above metallization. It is argued that this structural sequence follows from the effects of hybridization between the 1 valence band and the 1 + 1 conduction band as the gap narrows and closes, and that all rare-gas solids are likely to undergo an hcp→bcc transition with metallization occurring near, if not within, the range of hcp stability. The lower-pressure fcc→hcp transition in insulating Ar should occur below 230 GPa.

30168 **Calculation of the mobility of electrons injected in liquid argon.** Ascarelli, G. (Physics Department, Purdue University, W. Lafayette, Indiana 47907). *Physical Review [Section] B: Condensed Matter;* **33**: No. 8, 5825-5833(15 Apr 1986). Contract FG02-84ER13212.

A model calculation is carried out in which we evaluate the mobility of electrons injected in liquid argon. Scattering by both phonons and static density fluctuations is taken into account. The calculation for the mobility limited by phonon scattering differs from the usual calculation in crystals by considering both the local changes in the deformation potential and the changes of the amplitude of the phonons that are caused by the existence of density fluctuations. The calculation of the mobility limited by scattering from density fluctuations is carried out with the assumption that they give rise to a square-well (or barrier) potential that will scatter the electrons. The above perturbation ΔV_0 is related to a density fluctuation Δn by $\Delta V_0 = V_0(n\text{-bar}+\Delta n)-V_0(n\text{-bar})$. The scattering volumes Ω, where the density fluctuation Δn is located, are weighted by $\exp(-r/\xi)$ where ξ is the correlation length and r is the radius of Ω. The magnitude of the different density fluctuations is weighted by $\exp[-(\Delta n)^2\Omega/2nS(0)]$, where S(0) = nk/sub B/TK/sub T/, K/sub T/ is the isothermal compressibility. The calculation of the mean free path is carried out using partial waves. Both scattering mechanisms, scattering by phonons and static density fluctuations, give comparable contributions to the mobility.

30169 **Stability of ordered bulk and epitaxial semiconductor alloys.** Martins, J.L.; Zunger, A. (Solar Energy Research Institute, Golden, Colorado 80401). *Physical Review Letters;* **56**: No. 13, 1400-1403(31 Mar 1986). Contract AC02-77CH00178.

Using first-principles self-consistent total-energy calculations for unconstrained and epitaxially confined models of Si-C and Si-Ge alloys we study the general classes of stability of ordered phases of semiconductor alloys. The unusual ordering observed in SiGe grown on a Si substrate is explained.

30170 **Method and apparatus for casting conductive and semiconductive materials.** Ciszek, T.F. (to Dept. of Energy). US Patent 4,572,812. 25 Feb 1986. Filed date 13 Aug 1984. vp.

An apparatus is described for use in a process for casting a conductive or semiconductive material, comprising: conductive members arranged to be spaced from one another so as to define a container-like area for receiving and containing the material; and means for inducing first electrical currents in each of the conductive members, which first electrical currents act collectively to induce a second electrical current in the material. The second electrical current flows in a direction substantially opposite to the common direction of flow of the first electrical currents, so that the material is repelled away from an substantially prevented from contacting the conductive members during the casting of the material.

30171 **Method for the preparation of photochromic insulating crystals.** Abraham, M.M.; Boldu, J.L.; Chen, Y.; Orera, V.M. (to Dept. of Energy). US Patent 4,572,618. 25 Feb 1986. Filed date 28 Sep 1984. vp.

This patent describes a photochromic magnesium oxide crystal containing about 0.1 to about 0.01 weight percent, based on the amount of magnesium oxide, of lithium and about 0.05 to about 0.0005 weight percent, based on the amount of magnesium oxide, of nickel.

30172 **Method for production of free standing polycrystalline boron phosphide film.** Baughman, R. J.; Ginley, D. S. (to The United States of America as represented by the United States Department of Energy). US Patent 4,550,014. 29 Oct 1985. Filed date 9 Sep 1982. vp.

PAT-APPL-416409.

A process for producing a free-standing polycrystalline boron phosphide film comprises growing a film of boron phosphide in a vertical growth apparatus on a metal substrate. The metal substrate has a coefficient of thermal expansion sufficiently different from that of boron phosphide that the film separates cleanly from the substrate upon cooling thereof, and the substrate is preferably titanium. The invention also comprises a free-standing polycrystalline boron phosphide film for use in electronic device fabrication.

30173 **Photoelectrochemistry in particulate systems. 3. Phototransformations in the colloidal TiO_2-thiocyanate system.** Kamat, P.V. (Univ. of Notre Dame, IN). *Langmuir;* **1**: No. 5, 608-611(1985).

Association of SCN^- with TiO_2 colloids in acetonitrile resulted in the appearance of an absorption band with a maximum around 285 nm. The apparent association constant as measured by a Benesi-Hildebrand plot was 350 M^{-1}. Generation of $(SCN)_2^-$. was observed within the pulse duration (<8 ns) when the thiocyanate complex of TiO_2 in acetonitrile to 337-nm laser pulse excitation. The quantum yield for the production of $(SCN)_2^-$. was determined to be 0.04. With the aid of the laser flash photolysis, it has been demonstrated that one can carry out both the oxidation of SCN^- and the reduction of oxazine dye on the semiconductor particles simultaneously. Effective capture of the holes and electrons en-

hanced the efficiency of the photoelectrochemical oxidation and reduction processes at these microelectrodes. 22 references, 6 figures, 1 table.

30174 **Ion-exchange properties of activated carbon filled with hydrous Zr(IV) and Zr(IV)-P(V) oxides.** Shiao, S.Y.; Johnson, J.S. Jr.; Mohiuddin, G.; Hata, W.Y.; Tolan, J.S.; Doerr, W.W. (Oak Ridge National Lab., TN). *Journal of Chromatography;* **303**: 13-28(1984). Contract AC05-84OR21400.

Filling the pores of activated carbon with hydrous oxides allows one to take advantage of the attractive ion-exchange properties of the oxides and to avoid difficulties of column operation with the hydrous oxides alone arising from particle size, particle uniformity, and dispersibility. Procedures are outlined for incorporation of useful amounts of hydrous Zr(IV) oxide and mixed oxides of Zr(IV) and P(V) in high surface area charcoals. A dilute solution of Zr(IV) salt in solutions of moderate acid concentration is first contacted with the carbon and the Zr(IV) taken up precipitated with ammonia. More than one cycle may be desirable. Higher Zr(IV) oxide contents may be attained by pretreating the charcoal with nitric acid at elevated temperature. The rates of exchange between filled carbons and solution are adequate for column separations. 18 references, 10 figures, 2 tables.

40 CHEMISTRY

30175 **(UCID—20622-86-3) Chemistry research resource. Progress report, March 1986.** (Lawrence Livermore National Lab., CA (USA)). Apr 1986. Contract W-7405-ENG-48. 87p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE86009891.

Summaries are presented of projects in the following areas: synthesis of new materials, development of analytical techniques, chemical kinetics and transport processes, cryogenic and other physical properties of H isotopes, artificial intelligence, development of characterization techniques, materials modeling analysis, mechanical properties of polymers, physical metallurgy (mechanical properties, phase transformations), surface modification and surface studies, and new materials development and properties. (DLC)

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 29175, 29183, 29185, 29293, 29357, 29371, 29396, 30164, 30164, 30164, 30314, 30496, 30524, 30616

30176 **(BDX—613-3262) Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods.** Smith, R.E.; Smith, C.H. (Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.). Apr 1986. Contract AC04-76DP00613. 26p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86010276.

Two methods have been developed for determining Cr(III) in chromic acid solutions. Both methods are based on the formation of a Cr-EDTA complex. The ion chromatographic method detects the Cr-EDTA as an anion using chemically suppressed conductivity. The spectrophotometric method detects the Cr-EDTA as a colored complex by measuring the absorbance at 540 nm. The conditions necessary for forming the Cr-EDTA complex are described. The results obtained by the spectrophotometric and ion chromatographic methods are compared. 15 refs., 5 figs., 1 tab.

30177 (CONF-850314—Vol.2, pp 387-393) **Analytical techniques for the in-situ quantification of low-level waste.** Cline, J.E.; Hauf, M.J.; Lee, S.G.; Lubaszewski, R.T.; Bierman, M.R.; Byers, L.L.; Cameron, D.S. (Science Applications International Corp., Rockville, MD). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

A direct-assay technique quantitatively assays and characterizes the nuclides (including all 10CFR61 Table I and Table II nuclides) present in bulk radioactive wastes. Materials analyzed can include resins and sludges in transfer lines, tanks and liners, barreled oily wastes and DAW, and components stored in fuel pools. The methodology applies to a range of samples from high-activity resins and control-rod blades to slightly contaminated DAW. The system, based on advanced gamma-ray spectroscopy scanning techniques, combines scanning with sample analysis results and correlation methodology to give a complete waste analysis that allows efficient, accurate and cost effective classification for packaging, shipment and burial. The methodology can (1) improve accuracy by averaging over an entire container rather than depending upon a single small sample from the usually inhomogeneous waste, (2) reduce accumulated man-rem exposure where highly radioactive wastes must be sampled and analyzed, (3) allow a more knowledgeable and cost effective choice of shipping container and cask, and (4) reduce burial costs by allowing less conservative estimates of total curies shipped in each container. Several recent applications of the methods are presented and the results discussed. 14 refs., 7 figs., 3 tabs.

30178 **(EUR—10213) Certification of carbon and nitrogen in molybdenum (BCR No. 23).** Vandecasteele, C. (Commission of the European Communities, Luxembourg). 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86751646.

The experimental procedures used for the certification of carbon and nitrogen in molybdenum (CRM 023), which has already been certified for oxygen, are presented. Samples were analysed by 5 different laboratories using photon and charged particle activation analysis. The analytical methods and the approach used to analyse the data are described. The carbon content is certified to be below 0.2 μg/g; the nitrogen content to be below 0.3 μg/g. 8 refs.

30179 **(INIS-BR—456) Abstracts of the 26. Brazilian Congress on Chemistry.** (Associacao Brasileira de Quimica, Rio de Janeiro). 1985. 178p. (In Portuguese). (CONF-8510286—Absts.). NTIS (US Sales Only), PC A09/MF A01. File Number DE86701820.

From 26. Brazilian congress on chemistry; Fortaleza, CE, Brazil (6 Oct 1985).

The short communications of papers presented at the 26. Brazilian Congress on Chemistry, which are of nuclear interest, are presented. The papers are classified in four areas: isotope chemistry, organic chemistry, inorganic chemistry and physico-chemical.

30180 (INIS-BR—456, pp 89) **Use of arsenazo-III for the determination of uranium in phosphate materials. Study of interfering elements.** Nobre, J.S.M. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil). 1985. (In Portuguese). NTIS (US Sales Only), PC A09/MF A01. File Number DE86701820. (CONF-8510286—Absts.).

From 26. Brazilian congress on chemistry; Fortaleza, CE, Brazil (6 Oct 1985).

30181 **(N—86-16784) Microwave limb sounder for stratospheric measurements.** Waters, J.W.; Hardy, J.C.; Jarnot, R.F.; Pickett, H.M.; Zimmerman, P. (Jet Propulsion Lab., Pasadena, CA (USA)). Jun 1985. 38p. NTIS, PC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801.

The balloon-borne Microwave Limb Sounder (BMLS) measures atmospheric thermal emission from millimeter wavelength spectral lines to determine vertical profiles of stratospheric species. The instrument flown to data operates at 205 BHz to measure ClO, O_3, and H_2O_2. A 63 GHz radiometer is added to test the technique for determining tangent point pressure from the MLS experiment on the Upper Atmosphere Research Satellite (UARS). Many additional species is also measured by the BLMS. A radiometer at 270 GHz would provide measurements of HO_2, NO_2, HNO_3, N_2O, $^{16}O^{18}O^{16}O$, and HCN. With this addition the BMLS can test the current theory of O3 heavy ozone photochemical balance in the upper stratosphere.

30182 **Temperature dependence of retention in supercritical fluid chromatography.** Yonker, C.R.; Wright, B.W.; Petersen, R.C.; Smith, R.D. (Pacific Northwest Lab., Richland, WA). *Journal of Physical Chemistry;* **89**: No. 25, 5526-5530(5 Dec 1985). Contract AC06-76RL01830.

The complex dependence of retention in supercritical fluid chromatography as a function of temperature is examined. A thermodynamic relationship is derived which gives the slope of solute retention as a function of temperature at constant pressure and is used to model retention data. This model is dependent on the partial molar enthalpy of transfer (Δ anti H/sub i//sup ∞/) and solvent molar volume in retention is discussed based upon the comparison of this model with experimental data.

30183 **Separation of a five-component gas mixture by pressure swing adsorption.** Cen, P.; Yang, R.T. (State Univ. of New York, Buffalo). *Separation Science and Technology;* **20**: No. 9-10, 725-747(Nov-Dec 1985). Contract AC21-83MC20183.

Bulk separation of a five-component mixture simulating coal gasification products was performed by pressure swing adsorption (PSA) using activated carbon. The PSA cycle consisted of four commercially used steps: (I) pressurization with H_2, (II) adsorption, (III) blowdown, and (IV) evacuation. Using this cycle, four products were obtained with a single PSA unit: H_2 (over 99.7% purity), CO, CH_4, and acid gas (CO_2 + H_2S). The first three products contained less than 0.001% H_2S, and the acid gas was suitable for sulfur recovery. A mathematical model incorporating equilibrium adsorption of mixture and mass transfer resistance (of CO_2) was found capable of simulating all steps of the PSA cycle. The model simulation results were in fair agreement with the experimental data. A fundamental understanding of the dynamics of the cyclic process was gained through the model. 20 references, 9 figures, 7 tables.

30184 **Selectivity variations in anion chromatography.** DuVal, D.L. Ames, IA; Iowa State Univ. (1985). 184p. University Microfilms Order No. 85-14,395.Contract W-7405-ENG-82.

Thesis (Ph. D.).

Various organic acids are tested for use as eluents in single-column ion chromatography. Factors affecting their selectivity, sensitivity, and eluting strength are discussed. Coated anion exchange resins suitable for anion chromatography are also prepared. Their convenience, flexibility, and practical use as anion exchangers are demonstrated. Theories on ion exchange selectivity with high capacity ion exchange resins are reviewed. Interactions emphasized by each theory are pointed out as well as possible problems that could arise when applying these theories to explain selectivity variations found in anion chromatography. Previous studies in anion chromatography which exhibited selectivity variations are also reviewed and explanations for the variations are given. Parameters of the chromatographic system that could affect the selectivity of the system for various anions are investigated. Then, selectivity variations are explained in terms of interactions between components of the mobile phase and the stationary phase. Derivatization techniques necessary for species that are difficult or impossible to detect directly by anion chromatography are investigated. Methods are described for derivatizing cyanide and aldehydes in aqueous solution and then determining them by anion chromatography.

30185 **Eluent and ligand effects in cation chromatography.** Sevenich, G.J. Ames, IA; Iowa State Univ. (1985). 294p. University Microfilms Order No. 85-14,439.Contract W-7405-ENG-82.

Thesis (Ph. D.).

Low-capacity surface-sulfonated cation exchange resins were prepared from high-performance gel beads of moderate cross-linking. Conditions necessary to control the reaction and obtain high efficiency cation-exchange material of a low-capacity were explored. Effects of reaction parameters on the depth and degree of sulfonation are discussed. An alternate method of determining total exchange capacity is also described. Selectivity of polyvalent metal cations versus hydrogen, sodium, magnesium and ethylenediammonium cations is examined for the low-capacity sulfonated resins. Effects of complexing agents in the eluent are also examined for their effects on selectivity. Elution behavior with both complexing and non-complexing eluents are found to be predicted readily by use of the mass-action equilibrium expression for ion-exchange systems. The addition of complexing agents to the sample are shown to selectively complex certain metals as strong, stable complexes while leaving other metals essentially unbound. When injected, the masked ions do not compete for exchange sites on the column and are eluted in the void volume. The uncomplexed metal cations are chromatographed as usual. Analysis of alkaline earths in up to a 100-fold excess of interferent is carried out with reasonable recoveries. A method for speciation of iron by cation chromatography is described. Iron(II) is determined directly and iron(III) is detected after reduction to iron(II) just before injection. Choice of reducing agents and characteristics of the procedure are discussed. The method shows favorable comparison to the spectrophotometric determination using 1,10-phenanthroline.

30186 **Parallel capillary column gas chromatography in the determination of chlorinated pesticides and PCBs.** Schneider, J.F.; Bourne, S.; Boparai, A.S. (Argonne National Lab., IL). *Journal of Chromatographic Science;* **22**: 203-206(May 1984).

An improved method for the determination of chlorinated pesticides and PCBs using the parallel capillary column technique is described. The method employs two capillary columns in parallel from a common injector to separate detectors. This configuration allows simultaneous injection of a sample on two columns. The result is a more efficient, reliable way to identify and quantify these substances in environmental samples. 10 references, 7 figures, 2 tables.

30187 **Permeation of metal ions through a series of two complementary supported liquid membranes.** Danesi, P.R.; Cianetti, C. (Argonne National Lab., IL). *Journal of Membrane Science;* **20**: 201-213(1984). Contract W-31-109-ENG-38.

The permeation of Am^{3+} and Eu^{3+} through two composite supported liquid membranes, SLM, consisting of a series of two complementary SLMs, separated by an aqueous solution, has been studied. The first liquid membrane was a neutral membrane; the second liquid membrane was an acidic membrane; and the solid support was a microporous polypropylene film. The study has demonstrated that the single-stage character of SLM separations of metal ions in solution can be in principle overcome by repeating the composite SLM arrangement a number of times. The overall permeability of the composite SLM system to a given cation is shown to be a function of the single-membrane permeability coefficients as well as of the volumes of the aqueous solutions and the SLM area. 10 references, 8 figures, 2 tables.

30188 **Removal of isobaric interferences by resonance ionization mass spectrometry.** Donohue, D.L.; Young, J.P. (Oak Ridge National Lab., TN). *Proceedings of the Society of Photo-Optical Instrumentation Engineers;* **426**: 13-17(1983). Contract W-7405-ENG-26.

The technique of resonance ionization mass spectrometry (RIMS) has been successfully applied to the measurement of isotope ratios for several elements. In the case of neodymium and samarium, isobaric interference was removed at isotopic masses 144, 148 and 150. Isotope ratios were measured for these two elements in an equi-molar mixture, with a significant improvement in accuracy compared to conventional thermal ionization mass spectrometry. In addition, RIMS was applied to the elements uranium and plutonium in order to eliminate isobaric interferences at mass 238 and potentially at mass 241 (due to americium). Recent results are presented for measurements made on nanogram size samples loaded on resin beads. 13 references, 7 figures, 2 tables.

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 30123, 30161, 30174, 30179, 30188, 30234, 30280, 30285, 30293, 30296, 30297, 30307

30189 (CONF-850314—Vol.2, pp 357-361) **Studies of the volatility of cesium and iodine.** Gay, R.L.; McCoy, L.R.; Barclay, K.M.; Grantham, L.F. (Rockwell International Corp., Canoga Park, CA). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

Cesium and iodine are potentially volatile radionuclides which are present in both high-level and low-level wastes. Many volume reduction processes subject these wastes to elevated temperatures which are sufficient to cause volatilization to some extent. The volatilization of these radionuclides can have a major effect on off-gas system design and costs. A laboratory apparatus was used to study the effects of temperature, pH, and drying gas on the volatilization of cesium and iodine from bead and powdered ion exchange resins. A small bed reactor having a volume of about 80 cc was used to hold the resin sample. The reactor was located inside a laboratory oven to control temperature. Drying gases of nitrogen and air were tested. Ion exchange resins were pretreated to be completely loaded with nonradioactive cesium and iodine. In three separate tests, resins were heated from room temperature to temperatures of 140, 180, and 265°C. Cesium volatilization was below the limit of detection in all tests, that is, less than 0.2% of the cesium absorbed on the resins volatilized. Iodine volatilization was detected and found to be a function of temperature, pH, and drying gas. Significant volatilization of iodine occurred when the resins were in acidic solution and air was the drying gas. Iodine volatilization from resins in neutral or basic media with air as the drying gas was <0.3% (less than the limit of detection) when heated at 140°C. At temperatures of 180°C and 265°C, the iodine volatilization from powdered resins was 0.3% and 1.2%, respectively, and the volatilization from bead resins was 0.3% and 0.8%, respectively. 9 refs., 3 figs., 4 tabs.

30190 **(CONF-8509147—18) Magnetic susceptibility of CfN, CfAs, and CfSb.** Nave, S.E.; Moore, J.R.; Damien, D.A.; Huray, P.G.; Haire, R.G.; Peterson, J.R. (Tennessee Univ., Knoxville (USA); Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009458.

From ACTINIDES '85; Aix-en-Provence, France (1 Sep 1985).

Magnetic susceptibility measurements are reported for the compounds CfN, CfAs, and CfSb. These semimetallic compounds exhibit the NaCl-type cubic crystal structure. For these magnetic measurements the temperature was varied from 4.2 K to 340 K and the magnetic field from 1 to 50 kilogauss. The paramagnetic effective moments derived from Curie-Weiss fits to the data agree, within experimental error, with a theoretical value of 10.2 μ/sub B/ calculated for the $5f^9$ electronic state of Cf^{3+} assuming an intermediate-coupling model. Deviations of the susceptibility from Curie-Weiss behavior at lower temperatures are indicative of magnetic ordering and crystal-field splitting of the ground state. The ordering temperatures of these californium compounds are considerably lower than those observed previously for pnictides of curium and berkelium. This decrease in ordering temperature with increasing atomic number is consistent with the trend observed for the lanthanide monopnictides. 10 refs., 3 figs.

30191 (CSIR-SR-CHEM—267, pp 43-64) **Anorganic chemistry.** 1985. (In Afrikaans). NTIS (US Sales Only), PC A09/MF A01. File Number DE86780436.

In Annual report 1985.

The results of the chemical research on the synthesis and reactivity patterns of ruthenium complexes are discussed. Interactions of sulphur containing molecules with ruthenium systems were also studied. NMR spectra and x-ray crystallographic studies were used. Homogenic and molecular catalysis were also studied.

30192 (CSIR-SR-CHEM—267, pp 133-154) **Structure chemistry.** 1985. (In Afrikaans). NTIS (US Sales Only), PC A09/MF A01. File Number DE86780436.

In Annual report 1985.

NMR spectra and x-ray crystallography are the main techniques used for determining the structure of chemical compositions. ^{13}C NMR spectra was used to determine chemical shiftings. The electronic structure of an indole is also dealt with, as well as the dependence of carbon dioxide and carbonyl groups. A ruthenium complex was analysed and ^{1}H NMR spectra was used for the analysis of steroids. The use of x-ray crystallography for the determination of chemical structures is also discussed.

30193 **(CSIR-SR-CHEM—267) [Council for Scientific and Industrial Research, National Chemical Research Lab.]. Annual report 1985.** (Council for Scientific and Industrial Research, Pretoria (South Africa). National Chemical Research Lab.). 1985. 196p. (In Afrikaans). NTIS (US Sales Only), PC A09/MF A01. File Number DE86780436.

Individual papers in this report are abstracted separately. (PLG)

30194 **(DOE/ER/02542—4) Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986.** (Princeton Univ., NJ (USA). Dept. of Chemistry). 1986. Contract AC02-76ER02542. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010340.

Research was carried out in the general areas of collision dynamics and chemical kinetics. In summary, research on the following topics was pursued: The Use of Filtering Theory for the Inversion of Temporal Physical Systems; A Comprehensive Reaction Mechanism For Carbon Monoxide/Hydrogen/Oxygen Kinetics; Determining Important Aspects of Trajectory Design Problems; Sensitivity Analysis of Boundary Value Problems; Local and Global Parametric Analysis of Reacting Flows; Parametric Sensitivity of System Stability in Chemical Dynamics; Understanding the Relationship Between the Potential Surface and Observable in Classical Dynamics; Sensitivity Analysis of Steady State, Pre-Mixed Laminar Flames Using Newton's Method; An Analytical Preaveraging Approximation for the Numerical Evaluation of Matrix Elements Having Phase Sensitive Integrands. This work is reviewed in this report. 9 refs.

30195 **(DOE/ER/10980—4) Supported f-element complexes: surface chemistry and catalysis. Final report, August 15, 1984-January 14, 1986.** Marks, T.J.; Burwell, R.L. Jr. (Northwestern Univ., Evanston, IL (USA). Dept. of Chemistry). May 1986. Contract AC02-81ER10980. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010370.

The goal of this project is to elucidate, via a coordinated chemical and spectroscopic investigation, the nature of species produced when organo-f-element complexes (and by inference, early transition metal complexes as well) are adsorbed on high surface area metal oxides. These species constitute some of the most active olefin hydrogenation catalysts yet discovered and are also highly active for ethylene polymerication. Catalytic hydrogenation studies have been expanded from initial Cp'_2MR_2/propylene systems ($Cp' = (CH_3)_5C_5$, M = Th,U) to other olefins (for Cp'_2MR_2 catalysts, N/sub t/:propylene ≃1-butene >> isobutylene), metal complexes (N/sub t/:$Cp'MR_3$ >> Cp'_2MR_2 > $Me_2Si[(CH_3)_4C_5]_2MR_2$ >> Cp_2MR), and supports (for Cp_2MR_2 catalysts, N/sub t/:dehydroxylated Al_2O_3 > partially dehydroxylated Al_2O_3 >> dehydroxylated SiO_2). Mechanistic studies have included deuterium labelling, CO poisoning, and preliminary kinetic measurements.

30196 **(MLM—3347) Mound activities in chemical and physical research: July-December 1985.** (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 15 Apr 1986. Contract AC04-76DP00053. 40p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010330.

Four areas in low temperature research are reported. They are: ion densities in impure tritium; deuterium triple point temperature standard; second virial of helium 4 and helium 3 for gas thermometer; and thermal diffusion of polyatomic gases. In the area of separation research, the liquid phase thermal diffusion factor for $(CH_3)_4$ S: was measured. Also, numerical tests for the plutonium work integral are suggested, and the application of this expression to practical problems is discussed. 55 refs., 12 figs., 15 tabs.

30197 **Large-scale fluctuations and the critical behavior of dilute NaCl in H_2O.** Pitzer, K.S. (Univ. of California, Berkeley). *Journal of Physical Chemistry;* **90**: No. 8, 1502-1504(10 Apr 1986). Contract AC03-76SF00098.

It is shown that the effect on thermodynamic properties of large-scale fluctuations, which is substantial near the critical point for pure water, is rapidly suppressed by the addition of very small amounts of NaCl. A classical equation of state for pure water (i.e., with the fluctuation effect removed) is related satisfactorily to the

properties of dilute solutions of NaCl in H_2O on or near the critical line. This relatively simple relationship on a fully classical basis contrasts with very peculiar T-x and P-x critical lines found when the real, nonclassical properties of water have been used in an otherwise classical equation for the mixture. It is suggested that this procedure in which the effect of fluctuations is subtracted and the classical properties represented over a range of composition may be generally useful. 15 references, 3 figures, 1 table.

30198 **Some comments on multicomponent diffusion: negative main term diffusion coefficients, second law constraints, solvent choices, and reference frame transformations.** Miller, D.G.; Vitagliano, V.; Sartorio, R. (Lawrence Livermore National Lab., CA). *Journal of Physical Chemistry;* 90: No. 8, 1509-1519(10 Apr 1986). Contract W-7405-ENG-48.

Some interesting aspects of multicomponent diffusion in liquids are discussed. These include the existence of a negative main term diffusion coefficient; the utility of taking different components as the solvent; the change-of-solvent transformation for Fick's law coefficients and Onsager coefficients; the validity of the Onsager reciprocal relations on changing solvents; and the calculation of partial molar volumes from diffusion data. Previous work is surveyed on the irreversible thermodynamic basis for macroscopic diffusion; the importance of reference frames and transformations among them; and second law conditions on the volume-fixed diffusion coefficient matrix. Certain diffusion descriptions in other reference frames do not preserve these second law conditions. 78 references, 5 tables.

30199 **Reactions of chlorine with liquid metals. 3. Bismuth.** Balooch, M.; Siekhaus, W.J.; Olander, D.R. (Univ. of California, Livermore). *Journal of Physical Chemistry;* 90: No. 8, 1671-1676(10 Apr 1986). Contract AC03-76SF00098.

The reaction of molecular chlorine with solid and liquid bismuth was studied by modulated molecular beam-mass spectrometric methods over the temperature range 400-800 K and equivalent chlorine pressures of 5×10^{-6}-2×10^{-4} torr. The sole reaction product with solid Bi(0001) was $BiCl_3$. This species disappeared at the melting point. The molecular beam data collected on the trichloride product exhibited nonlinearity and evidence of both branched and series processes in the mechanism. These results, in conjunction with data obtained in a prior investigation of the system by thermal desorption spectroscopy, permitted development of a model of the reaction on the surface of the solid. With liquid bismuth, only BiCl was detected as reaction product. Its reaction probability increased with temperature, most likely because of a corresponding increase in the chlorine sticking probability. The 45° phase lag exhibited by this species indicated that the kinetics were dominated by solution and diffusion of chlorine in the bulk liquid bismuth. 15 references, 9 figures, 1 table.

30200 **Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems.** Miller, D.G.; Vitagliano, V. (Lawrence Livermore National Lab., CA). *Journal of Physical Chemistry;* 90: No. 8, 1706-1717(10 Apr 1986). Contract W-7405-ENG-48.

The dynamic theory of McDougall for convective instabilities induced by isothermal diffusion has been tested experimentally. These experiments, using two homogeneous layers separated initially by a sharp boundary (free diffusion), were done on the ternary system $SrCl_2$ (0.5 M)-NaCl (0.5 M)-H_2O, chosen because of its large cross-term diffusion coefficients. The experiments accurately verify McDougall's theory for the onset of the fingering instability at the center of the boundary. As predicted, this instability occurs first for compositions where the system is statically stable, i.e., no diffusion-induced density inversion. At boundary edges, density inversion and dynamic instability of the diffusive-overstable type begin simultaneously. The experiments are consistent with theory, although instabilities were not detected as close to the onset point as for fingering. Optical arrangements are described which are sensitive enough to detect the instabilities. Theoretical consequences of the free diffusion boundary conditions are that (1) at the edges the fingering instability condition is proportional to the static-diffusive one, and (2) the onset compositions at the edges depend only on D/sub ij/, whereas fingering at the center depends on H/sub i/ as well. 41 references, 13 figures, 4 tables.

30201 **Kinetics of CO oxidation over Ru(0001).** Peden, C.H.F.; Goodman, D.W. (Sandia National Labs., Albuquerque, NM). *Journal of Physical Chemistry;* 90: No. 7, 1360-1365(27 Mar 1986). Contract AC04-76DP00789.

The oxidation of CO over a model Ru(0001) single-crystal catalyst has been studied in a high-pressure reaction-low pressure surface analysis apparatus. Steady-state catalytic activity as a function of temperature and partial pressure of CO and O_2 was measured. Both the specific rates and the relative activity (Ru > Pd, Rh) obtained in this study compare very favorably with the results on high area supported catalysts. Surface concentrations of oxygen were monitored following reaction and found to be dependent on the partial pressures of the reactants. Further, the highest rates of reaction corresponded to reaction on a ruthenium surface covered with a monolayer of oxygen as detected subsequent to reaction by AES. The kinetics measured at various reactant partial pressures (leading to various surface oxygen coverages following reaction) suggest that a chemisorbed atomic oxygen species present at high oxygen coverages may be a crucial reaction intermediate, largely responsible for the optimum reaction rates. 32 references, 7 figures, 1 tables.

30202 **Reactions of HO_2 and O_2^- with iodine and bromine and the I_2^- and I atom reduction potentials.** Schwarz, H.A.; Bielski, B.H.J. (Brookhaven National Lab., Upton, NY). *Journal of Physical Chemistry;* 90: No. 7, 1445-1448(27 Mar 1986). Contract AC02-76CH00016.

The equilibrium constant for reaction of HO_2 with I_2 to form H^+, O_2, and I_2^- was measured to be 30 M at 25 °C. Derived free energies are ΔG/sub f/°(I_2^-) = -0.9 kcal/mol and ΔG/sub f/°(I/sub aq/) = 18.3 kcal/mol. Reduction potentials are E°(I/sub 2(aq)//I_2^-) = 0.21 V, E°(I_2^-/$2I^-$) = 1.03 V, and E°(I/I^-) = 1.33 V. Rate constants for reaction of HO_2 with I_2 and Br_2 are 1.8×10^7 and 1.3×10^8 M^{-1} s^{-1}. Rate constants for O_2^- reactions with I_2, I_2^-, Br_2, Br_2^-, and HOBr are 6.0×10^8, 0.25×10^8, 5×10^8, 1.5×10^8, and 3.5×10^8, and 3.5×10^8 M^{-1} s^{-1}. The activation energies for reaction of O_2^- with I_2 and with I_2^- are 3.3 and 4.9 kcal/mol. 15 references, 4 figures, 1 table.

30203 **Zero-field NMR of solid bis(μ-hydrido)decacarbonyltriosmium.** Zax, D.B.; Bielecki, A.; Kulzick, M.A.; Muetterties, E.L.; Pines, A. (Univ. of California, Berkeley). *Journal of Physical Chemistry;* 90: No. 6, 1065-1069(13 Mar 1986). Contract AC03-76SF00098.

In this work, zero-field proton NMR is applied to a polycrystalline sample of bis(μ-hydrido)decacarbonyltriosmium ($(\mu\text{-}H)_2Os_3(CO)_{10}$). Bis(μ-hydrido)decacarbonyltriosmium is of interest as a model for small-molecule-surface interactions. The solid-state structure makes it a good test compound for zero-field NMR methods. The internuclear dipole-dipole interactions are used as a probe of structure. Where high-field NMR methods cannot generally be applied to the study of large numbers of coupled spins, even in disordered (e.g. polycrystalline) materials zero-field NMR may result in analyzable spectra. The solid-state powder spectrum of $(\mu\text{-}H)_2Os_3(CO)_{10}$ is analyzed to give proton-proton distances which are compared with the results obtained from single-crystal diffraction methods. 18 references, 5 figures, 1 table.

30204 **Kinetics of one-electron transfer reactions involving ClO_2 and NO_2.** Huie, R.E.; Neta, P. (National Bureau of Standards, Gaithersburg, MD). *Journal of Physical Chemistry;* 90: No. 6, 1193-1198(13 Mar 1986).

Rate constants for the one-electron oxidation of ClO_2^- and NO_2^- by several organic and inorganic free radicals have been measured along with rate constants for several reactions of ClO_2, NO_2, and BrO_2. The kinetics of the reactions of ClO_2 and NO_2 are consistent with simple electron-transfer theory, except for the reaction of NO_2 with SO_3^{2-}, which appears to be oxygen atom transfer. Equilibrium constants have been determined for the reactions of ClO_2 with aniline at pH 6.9 and N,N-dimethylaniline at pH 9.6. This leads to one-electron redox potentials of 1.03 and 0.87 V for these aromatic amines, respectively, at the corresponding pH. 55 references, 3 figures, 2 tables.

30205 Calculated electron density distributions in ScS and Sc_3S_4. Franzen, H.F.; Nakahara, J.F.; Misemer, D.K. (Iowa State Univ., Ames). *Journal of Solid State Chemistry;* **61**: No. 3, 338-342(1 Mar 1986). Contract W-7405-ENG-82.

Previously calculated wavefunctions were used to calculate electron densities as functions of position within spheres surrounding Sc and S in scandium monosulfide and a hypothetical structure for the known scandium-deficient compound. The electron densities in the valence and conduction energy intervals are compared and interpreted in terms of the directionality of the electronic interactions in the compounds.

30206 Theoretical studies of the energetics and mechanisms of chemical reactions: abstraction reactions. Dunning, T.H. Jr.; Harding, L.B.; Bair, R.A.; Eades, R.A.; Shepard, R.L. (Argonne National Lab., IL). *Journal of Physical Chemistry;* **90**: No. 3, 344-356(30 Jan 1986). Contract W-31-109-ENG-38.

From International conference on chemical kinetics; Gaithersburg, MD, USA (17-19 Jun 1985).

First methods developed to locate and characterize critical points (minimia and saddle points) on molecular potential energy surfaces are reviewed. Then briefly the computational advances which are currently driving the development of algorithms for calculating potential energy surfaces are discussed. Finally, a sampling of the studies of simple abstraction reactions carried out in the Theoretical Chemistry Group at ANL over the past five years is presented. In this latter section focus is on a series of prototypical chemical reactions ($O + H_2$, $H + HX$, $CH + H_2$, $H + HCO$, $OH + H_2$, $H + HCN$, and $H_2 + C_2H$). Most of the above reactions involve direct processes; however, for the $CH + H_2$ and $H + HCO$ reactions indirect, addition-elimination pathways also play a role. For the homologous series of abstractions, $H + HX$ (X = F-I), simple exponential relationships are found both between the barrier heights and the reaction exoergicities and between the two bond extensions at the saddle point. Finally, the last two reactions, $H_2 + CN$ and $H_2 + C_2H$, are both highly exoergic and are predicted to have very early transition states. 94 references.

30207 Measurements of the pressure dependence of the HO_2 radical self-disproportionation reaction at 298 K. Kurylo, M.J.; Ouellette, P.A.; Laufer, A.H. (National Bureau of Standards, Gaithersburg, MD). *Journal of Physical Chemistry;* **90**: No. 3, 437-440(30 Jan 1986).

From International conference on chemical kinetics; Gaithersburg, MD, USA (17-19 Jun 1985).

Flash photolysis kinetic absorption spectroscopy was used to investigate the gas-phase disproportionation reaction of hydroperoxy radicals at 298 K. Measurements of k_1/σ (where k_1 is the rate constant and σ is the HO_2 absorption cross section) were made as a function of N_2 and O_2 pressures between 25 and 600 torr. Our observations of the linear dependence of k_1 on total pressure as well as of the existence of a finite bimolecular (zero-pressure) reaction component are in good agreement with other recent investigations. An analysis of our data using the equation $k_1 = k_1^0 + K/sub\ N_2/(N_2) + k/sub\ O_2/[O_2]$ yields $k_1^0 = 1.88 \times 10^{13}$ cm^3 molecule^{-1} s^{-1}, k/sub N_2/ = 5.95×10^{-32} cm^6 molecule^{-2} s^{-1}, and k/sub O_2/ = 4.53×10^{-32} cm^6 molecule^{-2} s^{-1}. An error band of +/- 20% is assigned for 95% confidence limits. Together with the earlier studies, the present work provides a detailed data base upon which to make rate constant recommendations for atmospheric modeling. 14 references, 3 figures, 1 table.

30208 Kinetics of the reaction OH + NH_3. Jeffries, J.B.; Smith, G.P. (SRI International, Menlo Park, CA). *Journal of Physical Chemistry;* **90**: No. 3, 487-491(30 Jan 1986). Contract AC03-81ER10906.

From International conference on chemical kinetics; Gaithersburg, MD, USA (17-19 Jun 1985).

Rate coefficients for the reaction of OH and NH_3 were measured over the range 840-1425 K by using an infrared laser pyrolysis technique with laser-induced fluorescence detection of OH. These direct measurements confirm the curvature of the Arrhenius plot which had been inferred from earlier work. Our results are combined with the data from ten other studies to provide a modified three-parameter Arrhenius form: $k(T) = 1.59 \times 10^{-17}$ T/sup 1.8/ exp(-500/RT) cm^3/s. Transition-state theory reaction rate constants are calculated which match the data over the temperature range 225-2350 K. 23 references, 5 figures, 1 table.

30209 Rate constant for the reaction H + NH_3 over the temperature range 750-1777 K. Michael, J.V.; Sutherland, J.W.; Klemm, R.B. (Brookhaven National Lab., Upton, NY). *Journal of Physical Chemistry;* **90**: No. 3, 497-500(30 Jan 1986). Contract AC02-76CH00016.

From International conference on chemical kinetics; Gaithersburg, MD, USA (17-19 Jun 1985).

The rate constant for the reaction of atomic hydrogen with ammonia has been measured over the temperature range 908-1777 K by the flash photolysis-shock tube technique using atomic resonance absorption to monitor (H)/sub t/. The Arrhenius rate expression is $k_1 = (3.02 +/- 0.30) \times 10^{-10} \exp(-8067 +/- 117/T)$ cm^3 molecule^{-1} s^{-1}. The rate constant was also measured at 750 K by the flash photolysis-resonance fluorescence (FP-RF) method: $k_1 = (1.27 +/- 0.18) \times 10^{-14}$ cm^3 molecule^{-1} s^{-1}. Detailed analysis of the kinetic data revealed that the Arrhenius plot is slightly nonlinear, and the shock tube data can be expressed by the three-parameter equation $k_1 = 1.06 \times 10^{-18}$T/sup 2.39 exp(-5119/T) cm^3 molecule^{-1} s^{-1}. This result is compared to that from a theoretical calculation, $k_1 = 1.16 \times 10^{-17}$ T/sup 2.17 exp (-6268/T) cm^3 molecule^{-1} s^{-1} for $600 \leq T \leq 2600$ K. Accepting the nonlinearity of the Arrhenius plot, the rate constant results from the two independent experimental techniques are in satisfactory agreement. 13 references, 2 figures, 3 tables.

30210 Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_6(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_6$(M identical with M) and i-PrOH leading to $W_3(H)_2(O\text{-}i\text{-}Pr)_{14}$. Chisholm, M.H.; Huffman, J.C.; Smith, C.A. (Indiana Univ., Bloomington). *Journal of the American Chemical Society;* **108**: No. 2, 222-230(22 Jan 1986).

Reaction between $W_2(NMe_2)_6$(M identical with M) and i-PrOH (>>6 equiv), which leads to the known compound $W_4(H)_2(O\text{-}i\text{-}Pr)_{14}$, is shown to be critically dependent on the presence of the liberated amine. The addition of i-PrOH (>>6 equiv) to hydrocarbon solutions of $W_2(O\text{-}t\text{-}Bu)_6$ or $W_2(O\text{-}i\text{-}Pr)_6(HNMe_2)_2$ does not lead to $W_4(H)_2(O\text{-}i\text{-}Pr)_{14}$ but rather yields an oliomeric species [W(O-i-Pr)$_3$]/sub n/. From the reaction between $W_2(O\text{-}t\text{-}Bu)_6$ in hexane/ROH and NaOR (1 equiv), hexane-insoluble compounds are formed: $NaW_2(H)(OR)_9$, where R = i-Pr and CH_2-t-Bu. Extraction into hexane solution by the addition of diglyme (1 equiv) yields $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme, which has been characterized by NMR studies and a single-crystal X-ray diffraction study. Crystal data for $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme at -155 °C are the following: a = 24.087 (8) A, b = 16.540 (5) A, c = 12.747 (4) A, β = 125.71 (1)°, Z = 4,d/sub calcd/ = 1.608 g cm^{-3}, and space group $P2_1/a$; for $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_6(H_2NMe)$ at -158 °C a = 18.159 (5) A, b = 10.873 (2) A, c = 11.599 (3) A, α = 77.30 (1)°, β = 109.37 (1)°, γ = 96.55 (2)°, Z = 2,d/sub calcd/ = 1.656 g cm^{-3}, and space group P1. 31 references, 7 figures, 7 tables.

30211 Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON. Curtiss, L.A.; Maroni, V.A. (Argonne National Lab., IL). *Journal of Physical Chemistry;* **90**: No. 1, 56-61(2 Jan 1986). Contract W-31-109-ENG-38.

The optimized geometries and vibrational frequencies of ONF and FON are determined by using second-order Moller-Plesset perturbation theory with the 6-31G* basis set. The geometry and frequencies of ONF are in good agreement with experiment, whereas the calculated vibrational frequencies of FON are in poor agreement with the observed frequencies. The theoretical predictions support the contention of Jacox that the band observed by Smardzewski and Fox at 1886 cm^{-1} is not the NO stretching fundamental of FON. Also, the predicted shifts in frequencies of the nu_2 and nu_3 bands upon isotopic substitution are in sharp disagreement with experimental shifts, raising the question of whether FON has actually been observed in low-temperature matrices. The FON isomer is calculated to be 40 kcal/mol less stable than ONF with a barrier of 8 kcal/mol for conversion of FON to ONF. The possibil-

ity that the ground state of FON is a triplet was also investigated. 38 references, 1 figure, 7 tables.

30212 **Chemiluminescence of CS_2i initiated by a thermal energy charge-transfer reaction with Ar^+.** Upschulte, B.L.; Shul, R.J.; Passarella, R.; Leuchtner, R.E.; Keesee, R.G.; Castleman, A.W. Jr. (Pennsylvania State Univ., University Park). *Journal of Physical Chemistry;* **90**: No. 1, 100-104(2 Jan 1986). Contract AC02-82ER60055.

Visible emissions due to the A²II/sub u/ - X²II/sub g/ transition of CS_2^+ transition of CS_2^+ have been observed in a flowing argon plasma. The excitation source has been identified as the thermal energy charge-transfer reaction $Ar^+ + CS_2 \rightarrow CS_2^+$ (A²II/sub u/) + Ar and not the reaction involving Ar_2^+ as has been suggested previously. The rates of both the Ar^+ and Ar_2^+ reactions with CS_2 are measured to be 3.5 x 10^{-10} and 7.0 x 10^{-10} cm^3/s, respectively. The applicability of considerations of energy resonance and favorable Franck-Condon factors to these reactions is discussed. 23 references, 5 figures, 1 table.

30213 **Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts.** Campbell, C.T. (Los Alamos National Lab., NM). *Journal of Physical Chemistry;* **89**: No. 26, 5789-5795(19 Dec 1985).

The role of cesium promoters in silver catalysts for the selective epoxidation of ethylene ($C_2H_4 + 1/2\ O_2 \rightarrow C_2H_4O$) has been studied by using adsorbed cesium on the surface of clean Ag(111) as a model catalyst. The experiments are performed in an apparatus that allows rapid transfer of the catalyst between an ultrahigh vacuum chamber for surface analysis (XPS, AES, LEED, TDS) and a high-pressure microreactor for kinetic measurements. At 300 K, Cs adsorbs on Ag(111) with strong lateral Cs-Cs repulsions giving rise to a series of LEED patterns and a very broad (300-800 K) thermal desorption spectrum. The surface saturates in a p(2 x 2) structure, interpreted as a close-packed Cs layer with theta/sub Cs/ = 0.25. Multilayers of Cs desorb at ~ 325 K. Dosing with Cs makes a Ag(111) catalyst that is less active but more selective for epoxidation at low conversion than clean Ag(111). Under reaction conditions, the Cs is converted to a surface cesium oxide (~ CsO_3), which exists in islands of LEED structure (2 $\sqrt{}$ 3 x 2 $\sqrt{}$ 3)R30°. This structure decomposes at ~ 610 K in thermal desorption, yielding gaseous Cs and O_2. Some Cs moves into the bulk during the reaction, desorbing as Cs above 700 K. 37 references, 8 figures.

30214 **FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3.** Liang, J.; Wang, H.P.; Spicer, L.D. (Univ. of Utah, Salt Lake City). *Journal of Physical Chemistry;* **89**: No. 26, 5840-5845(19 Dec 1985). Contract AC02-76ER02190.

Chemisorption of NO on Rh/Al_2O_3 surfaces has been examined by FT-IR. The spectra are assigned to two forms of Rh(NO) as well as the $Rh(NO)_2$ species. Apparent interconversion of the linear nitrosyl and dinitrosyl complexes is readily observed at room temperature. The dinitrosyl complex is characterized both by an invariant ratio of 1743- and 1825-cm^{-1} asymmetric and symmetric stretch bands with coverage and by isotopic data in ^{15}NO and the mixed ^{14}NO and ^{15}NO systems. Force constants for NO stretching motions and for NO/NO ligand interactions on $Rh(NO)_2$ have been used to successfully calculate the experimentally observed spectrum for the mixed isotope, dinitrosyl species. Thermal desorption data and displacement of adsorbed NO with CO are also reported. 27 references, 9 figures, 2 tables.

30215 **F + H_2 potential energy surface: the ecstasy and the agony.** Schaefer, H.F. III. (Univ. of California, Berkeley). *Journal of Physical Chemistry;* **89**: No. 25, 5336-5343(5 Dec 1985).

This account surveys 14 years of more or less continuing theoretical research on the FH_2 potential energy hypersurface. Early encouragement concerning the ability of theory to reliably characterize the entrance barrier for F + H_2 → FH + H has more recently been sobered by the realization that very high levels of theory are required for this task. The importance of zero-point vibrational corrections and tunneling corrections in reliable predictions of the same activation energy is discussed. In contrast, the barrier height of H + FH → HF + H three-center exchange stands as a prominent early success of ab initio molecular electronic structure theory. 90 references, 4 figures, 6 tables.

30216 **Dynamics of dissociative adsorption of hydrogen on Ni(100).** Hamza, A.V.; Madix, R.J. (Stanford Univ., CA). *Journal of Physical Chemistry;* **89**: No. 25, 5381-5386(5 Dec 1985).

Nearly monoenergetic beams of hydrogen and deuterium were used to determine dissociative sticking probabilities for H_2 and D_2 on Ni(100) at various energies. Variation of the surface temperature between 90 and 300 K had no effect on the dissociative sticking probability of H_2 at 3.6 and 5.8 kJ/mol incident beam energy, indicating a direct mechanism of dissociation. A four fold increase in the initial dissociative sticking probability for H_2 from 0.2 to 0.8 was observed by increasing the translational kinetic energy from 0.7 to 7.0 kJ/mol. The initial dissociative sticking probability for D_2 was slightly lower, increasing from 0.15 to 0.75 with increasing translational kinetic energy from 1.3 to 10.5 kJ/mol. The form of the increase with kinetic energy was explained by tunnelling through a low activation barrier, accounting as well for the high dissociation probability at low kinetic energies. The dissociative sticking probability decreased with hydrogen or deuterium adatom coverage at all energies. The decline in sticking probability with hydrogen coverage was fit to a s(theta) = s_0(1 - a theta)/sup n/ functional form. From this relationship it was deduced that hydrogen adatoms block only single sites and that four vacant sites are needed for dissociation. The dissociative sticking probability for H_2 declined precipitously from 0.77 to 0.16 with oxygen adatom coverage from 0 to 5% of a monolayer at a translational energy of 9.6 kJ.mol. 36 references, 8 figures.

30217 **Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals.** Kipouros, G.J.; Flint, J.H.; Sadoway, D.R. (Massachusetts Institute of Technology, Cambridge). *Inorganic Chemistry;* **24**: No. 23, 3881-3884(6 Nov 1985). Contract FG07-82CE40545.

The Raman spectra of molten alkali-metal hexachlorozirconate, hexachlorohafnate, hexachloroniobate, and hexachlorotantalate compounds have been obtained in the temperature range 623-1143 K. The results confirm that the refractory metal exists in the form of an octahedrally coordinated complex anion that is stable even in the molten state. For a given refractory metal the frequency of the nu_1 line increases as the size of the alkali-metal cation decreases. For a given alkali metal the frequency of the nu_1 line increases as the valence of the refractory metal increases. This last observation may serve as the basis for detecting, by Raman spectroscopy, aliovalent species that may form during the electrolysis of melts containing refractory-metal chlorides. 22 references, 4 figures, 2 tables.

30218 **Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation.** Onstott, E.I. (Los Alamos National Lab., NM). *Inorganic Chemistry;* **24**: No. 23, 3884-3888(6 Nov 1985).

Work of desolvation values for rare-earth-metal perchlorate, chloride, and nitrate electrolytes across the rare-earth-metal series from 0.1 to 1 m are relatively uniform and are in the sequence of perchlorates > chlorides > nitrates. Changes in TΔS in this region are in the sequence of perchlorates > nitrate > chlorides and reveal a geometric anion obstruction factor that depends on anion size and complexity. Desolvation energies for 0.2 m increments for the region of 1 m to saturation show that negative values of TΔS persist to saturation for the perchlorate series but TΔS values for chlorides all change from negative to positive near saturation. For the nitrate series at saturation, incremental values of TΔS are negative for lanthanum through gadolinium, near zero for terbium, dysprosium, holmium, and erbium, and positive for thulium, ytterbium, and lutetium. Zero crossing of incremental TΔS is interpreted to be an indicator that outer-sphere ion pairing is complete, and positive TΔS is the result of ion compression of inner-sphere cation water and electrolyte destructuring on formation of inner-sphere ion pairs by water displacement. 42 references, 4 figures, 2 tables.

30219 **Ferrimagnetism in $MnFeF_5.2H_2O$.** Jones, E.R. Jr.; Van Hine, C.; Datta, T.; Cathey, L.; Karraker, D.G. (Univ. of South Carolina, Columbia). *Inorganic Chemistry;* **24**: No. 23, 3888-3890(6 Nov 1985). Contract AC09-76SR00001.

The magnetic susceptibility of $MnFeF_5.2H_2O$ was measured at temperatures from 5 to 300 K for applied fields of up to 1 kOe with a SQUID susceptometer. A ferrimagnetic phase transition was observed at 38 +/- 0.25 K. At temperatures between 200 and 300 K the susceptibility followed a Curie-Weiss law chi = C/(T-Theta) with Theta = -164 K and an effective magnetic moment of 7.4 +/- 0.1 μ/sub B/. The Moessbauer resonance spectrum gave a quadrupole-split doublet with an isomer shift of 0.483 mm/s relative to α-iron, indicating that all of the iron was Fe^{3+}. 13 references, 4 figures, 2 tables.

30220 **Hydrogen.** Ross, P.N. (Lawrence Berkeley Lab., CA). pp 39-47 of Standard potentials in aqueous solution. Bard, A.J.; Parsons, R.; Jordan, J. (eds.). New York, NY; Marcel Dekker, Inc. (1985).

The relative thermodynamic data for hydrogen are tabulated, and the oxidation states of hydrogen are discussed. The electrode couples H_2/H^+, H_2/H^-, and D_2/D^+ are discussed in some detail. 17 references, 3 tables.

30221 **Manganese, technetium, and rhenium.** Hunter, J.C.; Kozawa, A. (Union Carbide Corp., Westlake, OH). pp 429-451 of Standard potentials in aqueous solution. Bard, A.J.; Parsons, R.; Jordan, J. (eds.). New York, NY; Marcel Dekker, Inc. (1985).

A brief summary of the aqueous electrochemistry of manganese compounds is provided. The oxidation states of manganese, technetium, and rhenium are discussed. Potentials of the various ions of these three elements are presented in tabular form. Thermodynamic data for magnesium, technetium, and rhenium are also tabulated. References for the three elements are cited separately, manganese 21; technetium 10; and rhenium 15. 8 references, 4 tables.

30222 **Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls.** Blau, R.J. Ames, IA; Iowa State Univ. (1985). 282p. University Microfilms Order No. 85-14,374.Contract W-7405-ENG-82.

Thesis (Ph. D.).

$[Pt_2(\mu\text{-dppm})_2Cl(PPh_3)]^+$ is formed from a rate-limiting bimolecular reaction of PPh_3 with $[Pt(\mu\text{-dppm})_2Cl_2]$ in CH_2Cl_2. Alternatively, it and its bromo and chloro derivatives can be formed from the reaction of halides with $[Pt(\mu\text{-dppm})_2\text{-}PPh_3)_2]^{2+}$ by (a) rate-limiting PPh_3 dissociation, or (b) rate-limiting $Pt_2(\mu\text{-dppm})$ ring opening at a Pt-P bond. Formation of product by (b) occurs after the formation of two observable intermediates, one of which, $[Pt_2\{eta^2\text{-dppm}\}(\mu\text{-dppm})X(PPh_3)]^+$, is readily characterized by $^{31}P\{^1H\}$ NMR spectroscopy. Rates of these ligand substitution reactions are very sensitive to the anions present in solution. Atropisomers due to hindered rotation around the Pt-PPh_3 bond of $[Pt_2(\mu\text{-dppm})_2Cl(PPh_3)]^+$ are caused by phenyl-phenyl repulsions and can be distinguished by $^{31}P(H)$ NMR spectroscopy. Such repulsions also retard the rate of positional interchange of axial and equatorial substitutents on its $Pt_2(\mu\text{-dppm})_2$ ring as observed by ^1H NMR spectroscopy. Several correlations between $^{195}Pt\text{-}^{31}P$ coupling constants and Pt-P and Pt-Pt bond lengths were observed. The synthesis, characterization, and reactivity of$[(Pt_2(\mu\text{-dppm})_2Cl)(di\text{-}eta^2\text{-}P_4)]^{2+}$ is reported. This complex is a dimer of platinum dimers bridged by tetra-phosphorus. One platinum of each dimer is bound to two phosphorus atoms of P_4. The formation and reactivity of the metal-carbon bonds in benzylcobalamin and chromium alkyls, $\{(H_2O)_5CrR^{2+}$; R = CH_2Ph, $CH(CH_3)OC_2H_5$, $CH_2OCH_3\}$, were also investigated.

30223 **Nuclear magnetic resonance studies of amorphous silicon hydrides: proton spin dynamics.** Fry, C.G. Ames, IA; Iowa State Univ. (1985). 204p. University Microfilms Order No. 85-14,398.Contract W-7405-ENG-82.

Thesis (Ph. D.).

The island size in amorphous silicon hydride has been estimated to be ~75 +/- 30 A for an assumed three-dimensional domain, or 40 +/- 20 A for a two-dimensional domain. These results were obtained using spin-diffusion via the Goldman-Shen experiment. Arguments have been given to suggest that the interpretation of the Lorentzian line shape should be reexamined. Several reasons, and some calculations provide motive for interpreting the Lorentzian line shape as due to monohydrides bonded to the interstitial surfaces parallel to the growth direction, where the surface has reconstructed to give the larger than expected internuclear separations leading to the narrow Lorentzian line shape. A combination of spin-lattice relaxation measurements and the Carr-Purcell-Meiboom-Gill (CPMG) experiment led to the identification of two hydrogen environments in addition to the monohydride Lorentzian line shape and the clustered Gaussian line shape. The fact that the Lorentzian line shape is due to a random distribution gives part of the distribution of monohydrides having nearest-neighbor separations so large that these monohydrides echo during a Hahn echo sequence. The information obtained from these experiments led to the conclusion that poor films have a small deviation in internuclear spacings, whereas good films have a much larger deviation in internuclear spacings. Molecular hydrogen is identified and quantified using the CPMG experiment. The decay rate of the m-H_2 during the CPMG experiment gives a direct measure of the strongest residual proton-proton dipolar interaction, which then gives a lower limit of 10 A for void dimensions. This result is a clear measure of the void size.

30224 **Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system.** Olsen, K.B.; Sklarew, D.S.; Evans, J.C. (Pacific Northwest Lab., Richland, WA). *Spectrochimica Acta, Part B: Atomic Spectroscopy;* **40B**: No. 1/2, 357-365(1985). Contract AC06-76RL01830.

Low-pressure and atmospheric pressure microwave-induced helium plasma detectors were interfaced with a capillary column gas chromatography. A number of dialkyl mercury, diaryl mercury, diaryl mercury and monoalkyl mercury chlorides have been separated on both systems. The capillary column is well suited for the separation of organomercury compounds, but the selection of the appropriate scavenge gas is critical to achieve good peak shapes for these mercury compounds. The atmospheric pressure system exhibited better sensitivity and selectivity for organomercury compounds than the low-pressure system. In addition to the organomercury compounds, satisfactory separation has been achieved for trimethyl, triethyl and triphenylarsine on the gas chromatograph low-pressure microwave plasma detector system. Preliminary work using the atmospheric-pressure system for arsenic and selenium line selection is also presented. 11 figures, 1 table.

30225 **Reduction of carbon dioxide by tris(2,2'-bipyridine) cobalt(I).** Keene, F.R.; Creutz, C.; Sutin, N. (Brookhaven National Lab., Upton, NY). *Coordination Chemistry Reviews;* **64**: 247-260(1985). Contract AC02-76CH00016.

Preliminary stoichiometric and kinetic results bearing on the mechanism of the reduction of HCO_3^+ to CO by tris(2,2'-bipyridine) cobalt (I) in aqueous media are reported. The results indicate that CO (not formate) is the dominant carbon product and that it is scavenged by $Co(byp)_3^+$ to give insoluble $[Co(bpy)(CO)_2]_2$. At pH ~ 9, bicarbonate reduction occurs in competition with H_2O reduction. Both processes are inhibited by bpy and promoted by H^+, suggesting the common intermediate $Co(pby)_2$ $(H_2O)H^{2+}$. The bicarbonate reaction itself branches to give H_2 and CO in ~ 3:1 ratio. 29 references, 5 figures.

30226 **Complexes of cesium and rubidium fluorides with bromine trifluoride.** Stein, L. (Argonne National Lab., IL). *Journal of Fluorine Chemistry;* **27**: 249-256(1985). Contract W-31-109-ENG-38.

Vibrational spectra are reported for the new complexes CsF x $3BrF_3$, RbF x $3BrF_3$, and RbF x $2BrF_3$ and the previously known complex CsF x $2BrF_3$. The spectra suggest that these compounds are salts having general formulas $M^+Br_3F_{10}^-$ and $M^+Br_2F_7^-$. 15 references, 1 figure, 1 table.

30227 Microstructures and growth rates of FeS on pure and not-so-pure iron. McKee, R.A.; Druschel, R.E. (Oak Ridge National Lab., TN). *Journal of the Electrochemical Society;* **131**: No. 4, 853-857(Apr 1984). Contract W-7405-ENG-26.

The sulfidation rates of iron to Fe/sub 1-xs/ have been measured for three batches of nominally pure iron, and rather significant differences in microstructures and growth rates have been observed. The measurements were made at 700°C over the sulfur pressure range of $1\text{-}10^3$ Pa as part of a study of the general aspects of the microstructures and growth rates of this highly nonstoichiometric sulfide of iron. Apparently due to rather small differences in silicon content, 0-40 ppm, the scale microstructure, scale adhesion, and growth rate vary significantly. Silicon that is dissolved as small Fe_2SiO_4 particles in the iron accumulates at the scale/metal interface during the sulfidation reaction causing a layered growth. The overall reaction rate is reduced at the lowest pressures, but remains unchanged at higher pressures. 7 references, 7 figures, 1 table.

30228 Rare-earth Moessbauer studies on chemical problems. Shenoy, G.K. (Argonne National Lab., IL). pp 343-354 of Chemical Moessbauer spectroscopy. Herber, R.H. (ed.). New York, NY; Plenum Publishing Corporation (1984).

The material in this section is limited to some of the chemical studies of Moessbauer studies of rare earths during the past 25 years. Particular attention is given to investigation of chemical bonding, electron hopping, and lattice anisotropy. The conversion electron Moessbauer spectroscopy with rare earth isotopes is discussed as to the future of this technique in resolving chemical problems. 20 references, 5 figures, 2 tables.

30229 Crystallite size effect in the selective oxidation of butene to butadiene on iron oxide. 1. Moessbauer, X-ray, and magnetization characterization of the catalysts. Hong, F.; Yang, B.L.; Schwartz, L.H.; Kung, H.H. (Northwestern Univ., Evanston, IL). *Journal of Physical Chemistry;* **88**: No. 12, 2525-2530(1984).

A series of silica-supported and unsupported iron oxide catalysts were characterized by X-ray diffraction, room-temperature Moessbauer spectroscopy, and low-temperature magnetization measurements. The average crystallite sizes were determined by the X-ray line-broadening technique. They ranged from 2.5 to 9.5 nm for the supported samples and from 14.5 to 61 nm for the unsupported samples. X-ray diffraction detected only the presence of α-Fe_2O_3. Fourier line-shape analyses showed that the samples were rather strain free, and the width of the crystallite size distribution increased with increasing average crystallite size. The Moessbauer parameters of both components are consistent with the assignment of α-Fe_2O_3. In particular, no component with zero quadrupole splitting assignable to γ-Fe_2O_3 was observed. Magnetization measurements showed that the small crystallite samples possess magnetic moments higher than that of bulk α-Fe_2O_3 but much lower than that of γ-Fe_2O_3. The data was explained by the absence of Morin transition and incomplete cancellation of spins in very small crystallites of α-Fe_2O_3. 29 references, 6 figures, 3 tables.

30230 Silver-tracer diffusion in Cu_2O. Peterson, N.L.; Wiley, C.L. (Argonne National Lab., IL). *Journal of Physics and Chemistry of Solids;* **45**: No. 3, 295-298(1984).

The diffusion of ^{110}Ag in Cu_2O has been measured by a serial-sectioning technique as a function of temperature (700-1132°C) and oxygen partial pressure (6×10^{-6}-8×10^{-2} atm). The data are fit to the defect model for Cu_2O developed by the authors in the preceding paper. Silver ions have a larger impurity-vacancy binding free energy and/or a larger jump frequency for the singly charged cation vacancies relative to that for the neutral cations vacancies. The activation enthalpies for the diffusion of copper and silver ions in CuO are nearly equal, but the absolute value of D/sub ag/* is about three times larger than D/sub Cu/* even though the silver ion is 31% larger than the copper ion. 5 references, 3 figures, 1 table.

30231 Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3). King, R.B.; Shimura, M.; Brown, G.M. (Univ. of Georgia, Athens). *Inorganic Chemistry;* **23**: No. 10, 1398-1404(1984). Contract W-7405-ENG-26.

Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with $CH_3N(PF_2)_2$ in acetonitrile solution at room temperature gives white, volatile, crystalline fac-$[CH_3N(PF_2)_2]_3Mo(CO)_3$, containing one monodentate and one bidentate $CH_3N(PF_2)_2$ ligand. The same reactants in boiling acetonitrile give yellow $[CH_3N(PF_2)_2]_4Mo_2(CO)_3$ in considerably better yield than the previously reported preparation of this binuclear complex from the cycloheptatriene complex $C_7H_8Mo(CO)_3$ and $CH_3N(PF_2)_2$ in boiling methylcyclohexane. Reaction in acetonitrile solution of fac-$(CH_3CN)_3Mo(CO)_3$ with $CH_3N(PF_2)_2$ containing about 0.2% HCl gives brown-red, volatile $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)-Mo(CO)(PF_2NHCH_3), whose composition and structure were established by single-crystal X-ray structure analysis. This novel quadruply bridged binuclear complex is obtained in considerably better yield from the reaction of $[CH_3N(PF_2)_2]_3Mo_2(CO)_3$ with $[(C_2H_5)_3NH]Cl$ in acetonitirle solution. The complex has a Mo-Mo bond 2.975 A in length. Crystal data: monoclinic, space group $P2_1/c$, a = 17.546 (4) A, b = 9.725 (2) A, c = 14.558 (3), β = 107.20 (2)°, Z = 4. 30 references, 2 figures, 3 tables.

30232 Cation impurity diffusion in CoO and NiO. Hoshino, K.; Peterson, N.L. (Argonne National Lab., IL). *Journal of Physics and Chemistry of Solids;* **45**: No. 8-9, 963-972(1984).

Impurity diffusion of ^{59}Fe, ^{54}Mn, ^{46}Sc, ^{88}Y, ^{95}Zr and ^{95}Nb in both CoO and NiO, and of ^{22}Na in CoO has been measured as a function of temperature (1000-1600 C) in air by the tracer-sectioning technique. It has been shown that the larger ions diffuse more rapidly and have a smaller activation energy than do smaller ions for transition-metal impurity ions having the same valence. The absolute values of the divalent-impurity diffusion coefficients in CoO and NiO are comparable to the self-diffusion coefficients of Co and Ni, respectively. The diffusion coefficients of the trivalent impurity ions are smaller than those of the divalent impurity ions in these oxides. The activation energies for impurity diffusion in CoO and NiO are discussed in terms of the ionic size and the charge state of the diffusion ions. 26 references, 9 figures, 5 tables.

30233 (LA-tr—85-58) Mechanism of thermal decomposition of krypton difluoride. Arutiunov, V.S.; Chaikin, A.M. Translated from *Reaction Kinetics and Catalysis Letters ;* **7**: No. 2, 145-150(1977). Contract W-7405-ENG-36. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009969.

A radical chain mechanism is proposed for the thermal decomposition of krypton difluoride, which is consistent with the experimental results in the intervals of 20 to 550°C and 0.4 to 300 torr. 7 refs.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 29176, 29177, 29178, 30146, 30179, 30191, 30192, 30196, 30222, 30224, 30231, 30282, 30286, 30291, 30292, 30296, 30297, 30307, 30322, 30651, 30652, 30815

30234 (DOE/ER/06030—T4) Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985. Ravishankara, A.R. (Georgia Inst. of Tech., Atlanta (USA). Georgia Technology Research Inst.). 1985. Contract AS05-78ER06030. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010338.

A fast flow system was assembled to study spectroscopic properties of aromatic species such as phenyl, phenoxy, and benzyl radicals. As an initial test of the system, extensive experiments were carried out on NO_2 free radicals. These experiments and the obtained results are briefly described below. 8 figs., 3 tabs.

30235 **(DOE/ER/10689—6) Reactions of metal ions and their clusters in the gas phase using laser ionization: ion cyclotron resonance spectroscopy. Progress report, July 1, 1985-June 30, 1986.** Freiser, B.S. (Purdue Univ., Lafayette, IN (USA). Dept. of Chemistry). Mar 1986. Contract AC02-80ER10689. 14p. (DOE/ER/10689—7). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009762.

We have made excellent progress in our two main thrust areas: (1) the generation and study of small metal cluster ions and (2) the photochemistry of metal ion complexes and clusters in the gas phase. Each of these areas has been made possible by the development in our laboratory of methodology involving Fourier transform mass spectrometry.

30236 **(DOE/ER/13022—3) Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986.** Cutler, A.R. (Rensselaer Polytechnic Inst., Troy, NY (USA)). 1986. Contract AC02-82ER13022. 45p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009965.

Ongoing synthetic and mechanistic transition organometallic chemistry studies in my research group focus on selectively converting ligated carbon monoxide into C_2-C_4 oxygenated organics. In particular, we are establishing viable coordinated ligand reactions for CO reduction and subsequent synthesis reactions (i.e., chain growth of the C_1 ligand by incorporating CO). Results obtained in these stoichiometric studies using fully characterized organometallic complexes then will be extended to more labile (and potentially catalytic) organometallic systems. The following sections detail the results of our DOE supported research during the period 9/1/83-8/31/86, on carbon monoxide fixation and synthesis reactions, and organometallic Lewis acids - bimetallic activation of coordinated ligands. 62 refs., 19 figs.

30237 **(DOE/ER/13260—T2) Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985.** Madey, R. (Kent State Univ., OH (USA)). 30 Nov 1985. Contract FG02-84ER13260. 17p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010236.

Research accomplishments during the report period include the following: (1) Measurements of the transmission of argon on activated carbon at 0 and 40°C, and extraction of the longitudinal and solid-phase diffusion coefficients by the moment-analysis method. (2) Design of an experiment to measure the transmission of radioactive argon-41 at the 2 megawatt research reactor at University of Michigan. (3) Measurements of the transmission of radioactive argon-41 on activated carbon at 0°C. (4) Derivations of expressions for the steady-state transmission and the first-order moment of a transmission curve for a step-function increase in the input concentration of an adsorbate flowing through an adsorber bed characterized by both solid- and gas-phase diffusion, mass-transfer resistance, and a first-order chemical reaction. (5) Analysis of the transmission of three binary mixtures (viz., propane and n-butane at 0 and 25°C, and n-butane and 1,3-butadiene at 25°C) on cross-linked polystyrene.

30238 **(DOE/PC/80532—3) Effect of organic gases on molecular formation reactions in the DCP.** McCreary, T.W.; Yoon, R.; Long, G.L. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Chemistry). 1986. Contract FG22-85PC80532. 18p. (CONF-860309—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009583.

From 37. Pittsburgh conference and exposition on analytical chemistry and applied spectroscopy; Atlantic City, NJ, USA (10 Mar 1986).

The primary problem with sample introduction in the DC plasma is not the creation of the analyte aerosol, but the introduction of the analyte aerosol into the atom cell. Unlike those atom cells in which the sample is constrained to pass through the center of the flame or plasma, in the DCP the sample is introduced under the plasma and cannot easily be forced to penetrate the plasma core. Hence, an aqueous aerosol is deflected around the plasma and resides on the outside skin of the plasma, which has a much lower excitation temperature. This deflection is thought to hinder the vaporization and molecular dissociation processes of the analyte. Also, it is now believed that significant metal oxide formation may occur in this region due to entrainment with air, leading to a reduced metal atom concentration. 7 refs., 8 figs.

30239 **Zero-field nuclear magnetic resonance of a nematic liquid crystal.** Thayer, A.M.; Millar, J.M.; Luzar, M.; Jarvie, T.P.; Pines, A. (Univ. of California, Berkeley). *Journal of Physical Chemistry;* **90**: No. 8, 1577-1581(10 Apr 1986). Contract AC03-76SF00098.

The molecular order parameter of CH_2Cl_2 in a nematic liquid crystal was measured by using a version of zero-field NMR employing pulsed dc magnetic fields. Spectral frequencies and intensities are shown to reflect the ordering on a molecular and macroscopic scale, respectively. Samples oriented in high magnetic field did not significantly change their state of alignment during the time scale of the field cycle. Zero-field measurements of the order parameter yielded values within experimental error of those measured in high field. A zero-field echo experiment was performed to decrease the effect of residual fields on line width. Dipolar order was created in zero field by using a pulsed dc field analogue of the Jeener-Brokaert experiment. 26 references, 8 figures.

30240 **Mutual orientation effects on electron transfer between porphyrins.** Cave, R.J.; Siders, P.; Marcus, R.A. (California Institute of Technology, Pasadena). *Journal of Physical Chemistry;* **90**: No. 7, 1436-1444(27 Mar 1986).

Mutual orientation effects on the rate of nonadiabatic electron transfer between several diporphyrin pairs of experimental interest are examined. The electronic matrix element for electron transfer is calculated within a one-electron spheroidal model for a variety of states and orientations which are relevant to both biological and synthesis electron-transfer systems. Both the mutual orientation of the pairs and the nodal structure of the donor and acceptor orbitals can have large effects on calculated rates. 61 references, 13 figures.

30241 **Structure and spectral properties of a squarylium dye, 2,4-bis[(1-n-butyl-2(1H)-quinolylidene)methyl]-1,3-cyclobutadienedilylium-1,3-diolate.** Bernstein, J.; Tristani-Kendra, M.; Eckhardt, C.J. (Ben-Gurion Univ. of the Negev, Beersheva, Israel). *Journal of Physical Chemistry;* **90**: No. 6, 1069-1073(13 Mar 1986). Contract FG02-79ER10535.

Structural and spectral characterizations of the title compound, 2,4-bis[(1-n-butyl-2(1H)-quinolylidene)methyl]-1,3-cyclobutadienediylium-1,3-diolate (BQMS), a prime candidate for a solar energy material, have been carried out. Crystals are monoclinic, $P2_1/n$ with $a = 9.586$ (2) A, $b = 9.730$ (2) A, $c = 13.894$ (3) A, $\beta = 99.77$ (9)°, and $Z = 2$. The structure has been solved by direct methods and refined by using 1078 reflections for which $F > 2\sigma$ (F) with anisotropic temperature factors on the non-hydrogen atoms to $R = 0.098$ and R/sub w/ $= 0.074$. Quasi-metallic reflection is observed along both principal directions for the (101) and (001) faces. The transition moment is found to be polarized along the long axis of the molecule. 16 references, 5 figures, 1 table.

30242 **Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles.** Jones, R.R.M.; Maldonado, R.; Szajdzinska-Pietek, E.; Kevan, L. (Wake Forest Univ., Winston-Salem, NC). *Journal of Physical Chemistry;* **90**: No. 6, 1126-1129(13 Mar 1986). Contract AS05-80ER10745.

Two-pulse electron spin echo modulation analyses of x-doxylstearic acid spin probes (x = 5, 7, 10, 12, and 16) in frozen lithium dodecyl sulfate (LDS) micelles in D_2O and lithium dodecyl-12,12,12-d_3 sulfate micelles in H_2O have been carried out. The results give information on the average conformation of the stearic acid chains and the distribution of D_2O and the -CD_3 end groups in the micellar aggregates. These are compared to data from dodecyl sulfate micelles with sodium or tetramethylammonium counterions (SDS and TMADS, respectively) which were studied previously in a similar fashion. The LDS micelles show a less compact and more hydrated headgroup region than SDS micelles. The -CD_3 surfactant end groups in LDS micelles are not concentrated at the micelle

center but are broadly distributed throughout the micellar volume. The surface and internal structure of LDS micelles is quite comparable to that of TMADS micelles and is different from that of SDS micelles. 23 references, 2 figures.

30243 **Thermodynamic and kinetic properties of the cyclohexadienyl radical.** Tsang, W. (National Bureau of Standards, Gaithersburg, MD). *Journal of Physical Chemistry;* 90: No. 6, 1152-1155(13 Mar 1986). Contract AI01-76PR06010.

The experimental data on cyclohexadienyl (1,3-cyclohexadien-5-yl) radical decomposition have been examined. In combination with an estimated entropy for cyclohexadienyl of 375 +/- 7 J/(Kmol) at 550 K, and the measured rates of hydrogen addition to benzene and the reverse the authors find the heat of formation of cyclohexadienyl to be 209 +/- 5 kJ/mol (300 K). This leads to k(cyclohexadienyl → benzene + H) = 10/sup 13.3 +/- 0.6/ exp(-13,100 +/- 700/T)/s in the vicinity of 550 K. The HC-H bond energy in cyclohexadiene is 318 kJ, leading to a resonance energy of 96 kJ. The second-order disappearance rate of cyclohexadienyl radical at 425 K has been found to be 7 x 10^{-11} cm^3/(molecule s). This is in excellent agreement with direct measurements at room temperature. 20 references, 1 figure, 3 tables.

30244 **Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media.** Chapman, D.M.; Buchanan, A.C. III; Smith, G.P.; Mamantov, G. (Oak Ridge National Lab., TN). *Journal of the American Chemical Society;* 108: No. 4, 654-663(19 Feb 1986). Contract AC05-84OR21400.

The electrochemical and homogeneous oxidations of phenoxazine (POZ) and phenothiazine (PTZ) to their highly persistent radical cations, POZ^+ and PTZ^+, and dications, POZ^{2+} and PTZ^{2+}, were studied in anhydrous $SbCl_3$-$AlCl_3$-BPCl (BPCl = N-(1-butyl)pyridinium chloride) mixtures with formal compositions close to neutral, i.e., 60-20-20 m/o at 23-27°C. The progress of these oxidations was followed by fast optical spectroscopy. The cations and dications were found to be persistent (no loss of nitrogenic protons) up to 150°C. ESR spectra of the radical cations were exceptionally well-resolved and allowed the first determination of all of the hyperfine constants. ^1H NMR spectra of the dications, measured in $SbCl_3$-$AlCl_3$ melts, are the first to be reported. The M(bpy)$_3$/sup nu+/ (bpy = 2,2'-bipyridine; M = Ru, Fe, Os; nu = 2,3) complex ions, used as homogeneous single electron transfer (SET) agents, were found to be robust and their SETs were facile in these media. Thus oxidation of heteroaromatics by Sb(III) were bonded (inner sphere) processes. In acidic media, the homogeneous oxidations of POZ^+ and PTZ^+ to POZ^{2+} and PTZ^{2+} by Sb(V) were slow reactions whose rates were inhibited by radical cation-solvent complexation involving the formation of chalcogen-Sb bonds. 44 references, 5 figures, 7 tables.

30245 **New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)_2X$ salts (X = ICl_2 and $BrICl^-$).** Emge, T.J.; Wang, H.H.; Leung, P.C.W.; Rust, P.R.; Cook, J.D.; Jackson, P.L.; Carlson, K.D.; Williams, J.M.; Whangbo, M.H.; Venturini, E.L.; Schirber, J.E. (Argonne National Lab., IL). *Journal of the American Chemical Society;* 108: No. 4, 695-702(19 Feb 1986). Contract W-31-109-ENG-38.

Two new organic metals, β-$(ET)_2ICl_2$ and β-$(ET)_2BrICl$, were synthesized, and their structures and electronic properties were characterized via X-ray diffraction, ESR studies, and band electronic structure calculations. BEDT-TTF, abbreviated ET, is bis(ethylenedithio)tetrathiafulvalene, $C_{10}S_8H_8$. The packing of the ET molecules within the sheetlike network of these two isostructural salts is significantly different from that of the two-dimensional metals β-$(ET)_2X$ with the larger anions X^- = I_3^-, I_2Br^-, IBr_2^-, and AuI_2^-, where all but X^- = I_2Br^- are ambient-pressure superconductors. The ESR studies for the β-$(ET)_2ICl_2$ salt show that it is metallic down to ~ 22 K, at which temperature a metal-insulator transition is observed. The band electronic structures calculated for β-$(ET)_2ICl_2$ and β-$(ET)_2BrICl$ reveal that these salts are one-dimensional metals. Comparison of the structures and electronic properties of the β-$(ET)_2X$ salts with large linear anions (e.g., X^- = I_3^-, I_2Br^-, IBr_2^-, and AuI_2^-) vs. those with the small symmetric $(Cl\text{-}I\text{-}Cl)^-$ and asymmetric $(Br\text{-}I\text{-}Cl)^-$ anions leads us to conclude that the nature of the interactions between ET molecules within a given sheetlike network, and hence the dimensionality of electrical properties, is strongly governed by the packing motif of ET molecules around a particular X^- anion. 42 references, 5 figures, 6 tables.

30246 **Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex.** Bakac, A.; Espenson, J.H. (Iowa State Univ., Ames). *Journal of the American Chemical Society;* 108: No. 4, 713-719(19 Feb 1986). Contract W-7405-ENG-82.

The nickel(I) macrocycle $Ni(1R,4R,8S,11S\text{-tmc})^+$ (tmc = 1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane) reacts readily with primary alkyl halides in alkaline aqueous solutions, yielding alkylnickel(II) complexes, $RNi(tmc)^+$. The reaction is proposed to occur in two steps, the first and rate-limiting being one-electron transfer from $Ni(tmc)^+$ to RX, either by halogen atom transfer or outer-sphere electron transfer, to yield an alkyl radical R. The latter is captured by $Ni(tmc)^+$ in a second and more rapid reaction. Free radicals are also involved in the formation of alkylnickel complexes in reactions of $Ni(tmc)^+$ with alkyl hydroperoxides. 53 references, 5 figures, 4 tables.

30247 **Mechanistic investigation of carbon-carbon bond formation in the reduction of alkyl halides by organonickel complexes in aqueous solution.** Bakac, A.; Espenson, J.H. (Iowa State Univ., Ames). *Journal of the American Chemical Society;* 108: No. 4, 719-723(19 Feb 1986). Contract W-7405-ENG-82.

The macrocyclic alkylnickel(II) complexes, $RNi(tmc)^+$ (R = C_6H_5, C_6H_7, and CH_3-c-C_6H_9; tmc = (1R,4R,8S,11S)-1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane), react with alkyl halides R'X (R' = CH_3, C_2H_5, 1-C_6H_7, 2-C_6H_7, and $PhCH_2$) in alkaline aqueous solutions, yielding combination and disproportionation products of R and R'. The reactivity of R'X increases in the order methyl < primary < secondary and Cl < Br < I. In the case R = R' = C_6H_5, the product distribution compares with that determined independently for ethyl radicals in aqueous solution. The proposed one-electron reduction of alkyl halide by the alkylnickel complexes in the rate-determining step produces an organonickel(III) complex and the alkyl halide radical anion. Both products rapidly eliminate ethyl radicals whose self-reactions yield the final products. Alkyl halide/alkyl radical exchange reactions effectively compete with radical self-reactions. The rate constant for the reaction C_6H_5 + 2-C_6H_7I → 2-C_6H_7 + C_6H_5I in aqueous solution was determined by competition with $V(H_2O)_6^{2+}$. The value k/sub 2-PrI/ ~ 6 x 10^8 M^{-1} s^{-1} is significantly higher than in aprotic solvents. 50 references, 2 figures, 3 tables.

30248 **Reactivity of large carbon clusters: spheroidal carbon shells and their possible relevance to the formation and morphology of soot.** Zhang, Q.L.; O'Brien, S.C.; Heath, J.R.; Liu, Y.; Curl, R.F.; Kroto, H.W.; Smalley, R.E. (Rice Univ., Houston, TX). *Journal of Physical Chemistry;* 90: No. 4, 525-528(13 Feb 1986).

The reactivity of bare carbon clusters produced by laser vaporization has been studied by a fast-flow gas-phase reactor followed by F_2 excimer laser ionization and time-of-flight mass analysis. Although most small carbon clusters (C/sub n/, with n < 40) were found to be highly reactive with such small molecules as NO, SO_2, and CO, the larger even n clusters (40 < n < 80) were found to be relatively inert. This lack of reactivity was most pronounced for C_{60} (Buckminsterfullerene). Inertness of the large even C/sub n/ clusters is evidence that they have closed into edgeless, spheroidal shells composed of 12 pentagonal rings and n/2 - 10 hexagonal rings. The possible role of similar shell structures in the formation and morphology of soot is considered. 16 references, 4 figures.

30249 **High-pressure study of triphenylmethane dyes in polymeric and aqueous media.** Clark, F.T.; Drickamer, H.G. (Univ. of Illinois, Urbana). *Journal of Physical Chemistry;* **90**: No. 4, 589-592(13 Feb 1986). Contract AC02-76ER01198.

Optical absorption measurements have been made for the hydrogen, methyl, and ethyl derivatives of triphenylmethane dye molecules dissolved in aqueous solution (to 10 kbar) and in plastic films of poly(methylmethacrylate) and polycarbonate (to 150 kbar) at 295 K to study the effects of environment both on the A and B rotational isomers of the dye molecules and also on the isomerization process. Absorption peaks associated with the isomers generally shift red with pressure, as is characteristic of PI → PI* electronic transitions. The partial molar volume of the system on isomerization from A to B increases slightly in all the media, depending on differences in the degree of solvation between the isomers. Anomalies associated with the ethyl derivative in aqueous solution are interpreted in terms of these differences. 18 references, 6 figures, 3 tables.

30250 **Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures.** Denison, L.S.; Cooper, R.; Sauer, M.C. Jr. (Argonne National Lab., IL). *Journal of Physical Chemistry;* **90**: No. 4, 683-687(13 Feb 1986).

The technique of pulse radiolysis has been used to study the kinetics of formation and decay of emissions in aromatic hydrocarbon/rare gas systems. The mechanism for the formation of the S_1 levels of anthracene, tetracene, and terphenyl in mixtures of the rare gases Ne, Ar, and Xe has been investigated. The authors have observed that, at low hydrocarbon pressures, the kinetics are adequately described by a sequential two-step process. The formation rate constant shows a linear dependence on hydrocarbon pressure and yields an overall rate constant for formation, in all systems studied, of approximately 1×10^{12} dm^3 mol^{-1} s^{-1}. These rate constants are too large to be accounted for by atomic collisional energy-transfer process and can only be interpreted in terms of subexcitation electrons being the immediate precursors of the S_1 levels. The rates of decay were independent of pressure variations and reflected the radiative lifetimes of the S_1 levels. A smaller effect of bulk rare gas pressure on the formation rate of the S_1 levels is observed ($\sim 10^9$ dm^3 mol^{-1} s^{-1}) and is attributed to electron cooling by momentum-transfer processes. 10 references, 5 figures, 4 tables.

30251 **Hydrogen-atom abstraction from alkanes by OH. 2. Ethane.** Tully, F.P.; Droege, A.T.; Koszykowski, M.L.; Melius, C.F. (Sandia National Labs., Livermore, CA). *Journal of Physical Chemistry;* **90**: No. 4, 691-698(13 Feb 1986).

Absolute rate coefficients for the reactions of OH with C_2H_6 (k_1), $C_2H_5D_1$ (k_2), and C_2D_6 (k_3) were measured with the laser photolysis/laser-induced fluorescence technique. Kinetic data were obtained at 600 torr of helium pressure over the temperature range 292.5-705 K. The measurements were fit to modified Arrhenius expressions of the form k/sub i/(T) = A/sub i/T/sup n/sub i// exp(-E/sub i//RT). Kinetic isotope effects were characterized by two simple relations: $k_3(T) = 0.5[k_1(T) + k_3(T)]$, and $k_1(T) = (1.01 +/- 0.06) \exp(907 +/- 52$ cal mol^{-1}/RT), where the quoted uncertainties represent $+/- 2\sigma$ estimates of the total experimental error. Nonempirical electronic structure calculations were performed on the reactants and transition-state structures. They are consistent with and support the experimental findings. 47 references, 8 figures, 4 tables.

30252 **Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions.** Neta, P.; Silverman, J.; Markovic, V.; Rabani, J. (National Bureau of Standards, Gaithersburg, MD). *Journal of Physical Chemistry;* **90**: No. 4, 703-707(13 Feb 1986).

Polymer radicals are produced by H abstraction from polyethylene glycol (PEG) and polybrene (PB) and by H abstraction and OH addition to polystyrenesulfonate (PSS). When ruthenium tris(bipyridyl) ions ($Ru(bpy)_3^{2+}$) are also present, they compete for OH and H radicals and produce the appropriate adducts. These adducts may disproportionate or react with the polymer radicals. The kinetic constants of these systems were measured by pulse radiolysis. The reaction products were also studied by dialysis of these systems following γ-irradiation. Under the conditions of these experiments the $Ru(bpy)_3^{2+}$-OH adduct (and probably also the corresponding H adduct) reacts with the polymer radicals. The products of these reactions are the appropriate polymer molecules with covalently bound $Ru(bpy)_3^{2+}$ residues. This method has a potential use in the synthesis of such compounds, which may be utilized for photochemical storage of light energy. 26 references, 4 figures, 1 table.

30253 **Optical spectroscopic studies of heme proteins at high pressure.** Swanson, B.I.; Agnew, S.F.; Ondrias, M.R.; Alden, R.G. (Los Alamos National Lab., NM). *Journal of the American Chemical Society;* **108**: No. 2, 341-343(22 Jan 1986).

There has been considerable interest in studying the physical and chemical behavior of small molecules at high static pressure by using diamond-anvil cells. In contrast to the relatively rich chemistry now developing on small molecules at high densities, studies of metalloproteins have largely been limited to relatively low pressures (<7 kbar) using UV-vis absorption, magnetic susceptibility, or NMR spectroscopy. Low-pressure studies of a variety of oxidized heme proteins have conclusively shown evidence for spin-state changes for the iron site at pressures above 1 kbar. Optical absorption studies of reduced heme proteins, while not conclusive, have also been interpreted in terms of spin-state changes. Other changes within the heme pocket most notably in the proximal histidine in the β-chain of Hb via proton NMR, have also been detected. The molecular bases for these changes and the behavior of the heme electronic states at higher pressures, however, remain open questions. In this paper both resonance Raman and absorption spectroscopy are used to address these problems in reduced heme proteins. Resonance Raman scattering is well suited for this application as it provides a structurally specific probe of the heme active site. 11 references, 2 figures.

30254 **Structure of trichloro(diethylenetriamine)gold(II), Au(dien)Cl_3, determined by single-crystal x-ray diffraction, Raman, and EXAFS spectroscopies: an EXAFS caveat.** Elder, R.C.; Watkins, J.W. II. (Univ. of Cincinnati, OH). *Inorganic Chemistry;* **25**: No. 2, 223-226(15 Jan 1986).

EXAFS spectroscopy of solid samples suggests that Au(dien)Cl_3 is a molecular entity with pseudooctahedral coordination. The three nitrogen donors from the dien ligand and one chlorine form an equatorial plane with two axial Au-Cl bonds of uncertain length (2.6 or 3.0 A) completing the coordination sphere. A single-crystal X-ray diffraction study confirms the overall structure but yields axial Au-Cl lengths of 3.121 (4) and 3.183 (3) A. The crystals are orthorhombic, space group Pbca, with cell constants a = 12.442 (5), b = 12.878 (9), and c = 13.177 (3) A and eight molecules per unit cell. These molecules were further characterized by Raman spectroscopy in solution as well as the solid state. Equatorial and axial Au-Cl stretching vibrations are observed for both phases, indicating some stability of the Au-Cl(axial) bonds in solution. 25 references, 3 figures, 4 tables.

30255 **Effect of high pressure on critical concentration energy transport in isotopically mixed naphthalene crystals.** Variano, B.F.; Brenner, H.C.; Daniels, W.B. (New York Univ., NY). *Journal of Physical Chemistry;* **90**: No. 1, 7-9(2 Jan 1986).

High pressure has been observed to enhance significantly triplet energy transfer from naphthalene-h_8 traps to β-methylnaphthalene supertraps in a naphthalene-d_8 crystal near the critical trap concentration, as indicated by supertrap/trap phosphorescence ratios. This suggests the importance of long-range interactions in triplet transport in this crystal system. 16 references, 1 figure, 1 table.

30256 **Fourier transform infrared spectroscopic study of the thermal stability of peroxyacetyl nitrate.** Senum, G.I.; Fajer, R.; Gaffney, J.S. (Brookhaven National Lab., Upton, NY). *Journal of Physical Chemistry;* **90**: No. 1, 152-156(2 Jan 1986). Contract AC02-76CH00016.

The unimolecular decomposition of peroxyacetyl nitrate (PAN) to form methyl nitrate and carbon dioxide has been studied

over the temperature range 298-338 K by Fourier transform infrared spectroscopy (FTIR). Pure PAN samples (> 98%; 2-30 torr) were found to decompose thermally, nearly quantitatively, to these products, with the only other observed product being nitromethane (< 10%). Both PAN decomposition and methyl nitrate formation rates yielded the Arrhenius equation, $k = (2.1 \times 10^{12}) \exp(-24.800 +/- 1800 \text{ cal}/(K \text{ mol}/RT)) \text{ s}^{-1}$. Perdeuterio-PAN was synthesized and observed to decompose to perdeuteriomethyl nitrate and carbon dioxide with no apparent isotope effect. One pathway is a concerted reaction most likely proceeding via a cyclic intermediate, and the other previously identified equilibrium between PAN and the peroxyacetyl radical and nitrogen dioxide. The rate of the PAN decomposition in a large excess of NO was determined to be $2.2 \times 10^{-4} \text{ s}^{-1}$ at 298 K. This rate is somewhat slower than previously reported for this pathway. The results are discussed with respect to the atmospheric lifetime of PAN and the potential atmospheric production of methyl nitrate. 24 references, 3 figures, 4 tables.

30257 **In situ study of the hydrogenation of diphenyl ether in the presence of pyrrhotite and H_2S.** Montano, P.A.; Stenberg, V.I.; Sweeny, P. (West Virginia Univ., Morgantown). *Journal of Physical Chemistry;* **90**: No. 1, 156-159(2 Jan 1986).

In the present study the results are reported for measurements of the conversion of diphenyl ether to benzene and phenols in the presence of a pyrrhotite catalyst. In situ Moessbauer measurements were performed during the catalytic conversion of diphenyl ether. The presence of Fe_3O_4 is detected in the residues after reaction; Fe/sub 1-x/S is also observed. Under high H_2S partial pressures in the reactor, the conversion increases, and for a 10% H_2S partial pressure, the Moessbauer spectrum shows the presence of FeS_2. The amount of Fe_3O_4 is practically reduced to zero in this case with Fe/sub 1-x/S dominating the spectrum. All the Moessbauer spectra show the presence of a singlet line after reaction. This spectrum results from the interaction of the iron in the pyrrhotites with the compounds present in the reactor at high temperatures. The conversion of diphenyl ether is negligible in the absence of pyrrhotite. The higher activity observed for conversion in the presence of H_2S is related to the effect this compound has in controlling the stoichiometry of the pyrrhotites. The activity observed in the iron sulfides toward hydrogenation of diphenyl ether is suggestive of a catalytic role for such sulfides in the cleavage of oxygen bonds in direct coal liquefaction. 18 references, 6 figures.

30258 **Temperature effects on rates of dehalogenation of aromatic anion radicals.** Meot-Ner (Mautner), M.; Neta, P.; Norris, R.K.; Wilson, K. (National Bureau of Standards, Gaithersburg, MD). *Journal of Physical Chemistry;* **90**: No. 1, 168-173(2 Jan 1986).

The temperature dependence of the unimolecular dehalogenation of radical anions of nitrobenzyl halides and haloacetophenones was measured between -7 and 70°C. Activation parameters range from E/sub a/ = 11.2-16.9 kcal/mol and log A = 12.7-17.1. Both E/sub a/ and log A increase from p- to o-nitro radicals and from chloro to bromo radicals. Unfavorable steric effects that move the halogen atom out of the aromatic plane result in lowered A factors. In general, the variation of k_{294} with structure depends in a complex way on the combination of E/sub a/ and log A factors, which suggests caution in the evaluation of rate constants at one temperature. The fast unimolecular dissociation of $(p\text{-}NO_2C_6H_3CH_3Br)^-$. ($k_{294} = 4.6 \times 10^6 \text{ s}^{-1}$) allows measurement of the slower bimolecular electron transfer $(C_6H_5NO_2)^-$. + $p\text{-}NO_2C_6H_4CH_3Br \rightarrow (p\text{-}NO_2C_6H_4CH_3Br)^-$. + $C_6H_5NO_2$ ($k_{294} = 1.9 \times 10^6 \text{ M}^{-1} \text{ s}^{-1}$). Both the activation energy and probability factor contribute to the slow rate, possibly due to a geometry change upon the reduction of $ArNO_2$. Extending the temperature studies to supercooled solutions shows no discontinuity of the unimolecular rate constants near the phase transition temperatures. 24 references, 4 figures, 1 table.

30259 **Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift.** Silverman, I.R.; Daub, G.H.; Vander Jagt, D.L. (Univ. of New Mexico, Albuquerque). *Journal of Organic Chemistry;* **50**: No. 26, 5550-5556(27 Dec 1985).

The synthesis of 9-methoxy-4,5-dihydrobenzo[a]pyrene-4-^{13}C 4,5-oxide and -5-^{13}C 4,5-oxide and of 8-methoxy-4,5-dihydrobenzo[a]pyrene-4-^{13}C 4,5-oxide is reported. The compounds were synthesized in yields of 15% each from unlabeled precursors. ^{1}#C NMR analysis of the conversion of the 4,5-oxides to 4-phenols and 5-phenols (NIH shift) revealed a very strong electronic effect of a 9-methoxy substituent, which gave only the 4-phenol, and a significant but weaker effect of an 8-methoxy substituent, which gave both phenols with the 5-phenol predominating. 18 references, 3 figures, 1 table.

30260 **Synthesis, rapid resolution, and determination of absolute configuration of racemic 2,2′-binaphthyldiyl crown ethers and analogues via β-cyclodextrin complexation.** Armstrong, D.W.; Ward, T.J.; Czech, A.; Czech, B.P.; Bartch, R.A. (Texas Tech Univ., Lubbock). *Journal of Organic Chemistry;* **50**: No. 26, 5556-5559(27 Dec 1985). Contract AS05-84ER13159.

Twenty racemic and four diastereomeric 2,2′-binaphthyldiyl crown ethers and analogues were synthesized. Chiral interactions between these compounds and immobilized β-cyclodextrin were examined. Thirteen of the enantiometic pairs and two of the diastereomers were successfully resolved. It was found that relatively small changes in the structure of these compounds could have large effects on chiral recognition. In general, the (-)-S enantiomers formed stronger inclusion complexes with β-cyclodextrin than did the (+)-R enantiomers. 40 references, 2 figures, 2 tables.

30261 **Conformational analysis of 1,4-cyclohexadienes. A shallow boat-shaped 1,4-dihydronaphthalene.** Rabideau, P.W.; Mooney, J.L.; Hardin, J.N. (Indiana Univ.-Purdue Univ., Indianapolis). *Journal of Organic Chemistry;* **50**: No. 26, 5737-5740(27 Dec 1985).

The metal/ammonia reduction of 7,12-dihydropleiadene affords 3,7,12a,12-tetrahydropleiadene which models indicate can exist in one of three different conformations (or in a dynamic equilibrium). Two of these conformers possess fully-puckered, boat-shaped 1,4-dihydronaphthalene units (5a and 5b) whereas the third (5c) incorporates a flattened six-membered ring. This latter conformation is the favored one as deduced by a variety of NMR techniques and is also predicted by MM2 force field calculations. The NMR parameters from 5c are then applied to stereochemical problems associated with a number of previously investigated 1-R-1,4-dihydronaphthalenes (R = CO_2H, Ph, CH_2OH, or $C(CH_3)_2OH$). MM2 results are also presented for the entire sequence. It is concluded that flattened boat conformations are expected to be common for many 1-R-1,4-dihydronaphthalenes. 15 references, 2 figures, 2 tables.

30262 **Gas evolution oscillators. 6. Quantitative characterization of an experimental system.** Kaushik, S.M.; Rich, R.L.; Noyes, R.M. (Univ. of Oregon, Eugene). *Journal of Physical Chemistry;* **89**: No. 26, 5722-5725(19 Dec 1985).

If a solution of formic acid in concentrated sulfuric acid is stirred so rapidly that carbon monoxide is evolved smoothly, and if the gas above the solution is separated from the atmosphere by a capillary leak, the excess pressure of that gas at any time is proportional to the rate of the reaction producing it. A run initially about 6 M each in HCOOH and in H_2O exhibited kinetics very close to second order in residual formic acid even though dilute solutions of formic acid exhibit excellent first-order kinetics under similar conditions. The discrepancy can be rationalized if the rate of decomposition is proportional to $(HCOOH)/(H_3O)$ where the product H_2O is the strongest base in the system. If the rate of stirring was reduced, the pressure in the flask exhibited oscillations whose amplitudes and periods varied up to about 50% from one run to another but which were usually well-defined throughout most of a single run. Dynamic parameters were also determined for escape of gas through a specific capillary and for the effects of stirring on transport of gas molecules through the surface of the solution. All necessary parameters have now been determined in order to undertake a quantitative comparison of experimentally measured and computed pressures in this system.

30263 Small-angle neutron-scattering study of alkyl polyoxyethylene sulfate micelles. Effect of the number of polyoxyethylene groups on n-dodecyl polyoxyethylene sulfate in D_2O/H_2O mixtures at 25°C. Triolo, R.; Caponetti, E.; Graziano, V. (Istituto di Chimica Fisica, Palermo, Italy). *Journal of Physical Chemistry;* **89**: No. 26, 5743-5749(19 Dec 1985).

Small-angle neutron scattering (SANS) data have been obtained for $C_{12}H_{25}(OC_2H_4)$/sub n/SO_4Na, with n being 0, 1, 2, and 4. Results are presented for a series of solutions containing approximately 0.06 M surfactant in different D_2O/H_2O mixtures. The SANS data can be described in terms of a model of monodispersed hard spheres interacting via a screened Coulombic potential. 15 references, 3 figures, 3 tables.

30264 Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane. Setser, D.W.; Lee, T.S.; Danen, W.C. (Kansas State Univ., Manhattan). *Journal of Physical Chemistry;* **89**: No. 26, 5799-5805(19 Dec 1985).

The infrared multiphoton absorption and dissociation of CF_3CH_2Cl has been studied by measuring the dependence of the reaction probability and product distribution on the laser fluence and bath gas pressure. Absorption measurements were performed at two laser frequencies to establish the absorbed laser energy; the absorption measurements displayed Beer's law behavior except at very low laser fluence. Sensitized reactions with SiF_4 were conducted for comparison to the direct laser-induced process; the effective temperature within the irradiated volume for the SiF_4 experiments was determined as a function of incident laser energy. The three main reaction channels are four-centered HF elimination, three-centered HCl elimination, and C-Cl homolysis; the product ratios were very dependent on the incident laser fluence. The infrared laser-induced energy absorption and reaction processes of CF_3CH_3, CF_3CH_2Cl, and CF_3CH_2Br are compared. The data provide evidence for a fluence-dependent fractionation of absorbed laser energy producing a two-component energy distribution for the former two compounds. 24 references, 10 figures, 2 tables.

30265 Use of organic molecules as mechanistic probes for semiconductor-mediated photoelectrochemical oxidations: bromide oxidation. Fox, M.A.; Pettit, T.L. (Univ. of Texas, Austin). *Journal of Organic Chemistry;* **50**: No. 25, 5013-5015(13 Dec 1985).

Cyclohexene has been used as an organic probe for mechanism in the semiconductor-photocatalyzed oxidation of bromide in acetonitrile. Products derived from bromine addition and from cyclohexenyl radical mediated autooxidation were isolated. These results implicate a mechanism in which the photoexcited semiconductor effects a one-electron oxidation of adsorbed bromide, producing surface-bound bromine atoms. These potentially could abstract hydrogen from cyclohexene to initiate autooxidation or could migrate along the semiconductor surface, producing bromine (Br_2), which migrates into solution where it is rapidly trapped in conventional electrophilic addition. 15 references, 1 figure, 1 table.

30266 Comparison of thionitrosyl and nitrosyl bonding in dicarbonyl(eta^5-cyclopentadienyl)chromium complexes by gas-phase ultraviolet and x-ray photoelectron spectroscopy. Lichtenberger, D.L.; Hubbard, J.L. (Univ. of Arizona, Tucson). *Inorganic Chemistry;* **24**: No. 23, 3835-3841(6 Nov 1985). Contract AC02-80ER10746.

The gas-phase He I/He II UPS and Mg Kα XPS data for the compounds (eta^5-C_5H_5)Cr(CO)$_3$NO and (eta^5-C_5H_5)Cr(CO)$_3$NS are reported. The first ionization potentials for the two complexes are nearly the same. A short C-O stretching progression in the first ionization band of the nitrosyl compound shows that it is predominantly associated with metal d character and is symmetrically π delocalized into the carbonyls. The next two ionizations for both complexes are sensitive to the π symmetry interaction with the NO or NS group. These ionizations are slightly destabilized and are sharper for the NS complex relative to the NO complex, showing stronger metal π interaction with both the NS π bond and π^* orbitals. The nitrogen 1s binding energy for the NS complex is almost 2 eV lower than that for the NO complex, suggesting a much more negative charge on the NS nitrogen. In contrast, the chromium, carbon, and oxygen core binding energies do not differ significantly between the two complexes. A formal potential model analysis of the (Cr-N-O) and (Cr-N-S) XPS shifts indicates a slightly more positive metal in the NS complex. These results are in agreement with Fenske-Hall approximate calculations and with other physical properties of the two compounds. 25 references, 10 figures, 4 tables.

30267 Method of saccharifying cellulose. Johnson, E. A.; Demain, A. L.; Madia, A. (to The United States of America as represented by the United States Department of Energy). US Patent 4,540,664. 10 Sep 1985. Filed date 13 May 1983. vp.

PAT-APPL-494482.

A method of saccharifying cellulose by incubation with the cellulase of Clostridium thermocellum in a broth containing an efficacious amount of a reducing agent. Other incubation parameters which may be advantageously controlled to stimulate saccharification include the concentration of alkaline earth salts, pH, temperature, and duration. By the method of the invention, even native crystalline cellulose such as that found in cotton may be completely saccharified.

30268 Identifying alkylbenzene isomers with chemical ionization-proton exchange mass spectrometry. Hawthorne, S.B.; Miller, D.J. (Univ. of North Dakota Energy Research Center, Grand Forks). *Analytical Chemistry;* **57**: No. 3, 694-698(Mar 1985). Contract FC21-83FE60181.

Chemical ionization-proton exchange mass spectrometry (CIPE) allows the number of unsubstituted aromatic carbons in alkylbenzene isomers to be determined. Only the aromatic hydrogens undergo exchange with deuterium when deuterated water, methanol, or ethanol is used as the reagent gas. Chemical ionization with deuterated methanol gives an acceptable mass spectral background and allows the determination of the number of unsubstituted positions on the benzene ring yielding structural information often unavailable from conventional electron impact spectra. Structural isomers such as propyl-, methylethyl-, and trimethylbenzene can easily be identified. The comparison of CIPE spectra from standard compounds, which are often unavailable, is not required to determine the number of unsubstituted aromatic carbons in alkylbenzene isomers. The method also allows ortho and para to be distinguished from meta disubstituted alkylbenzenes. Deuteriomethanol chemical ionization is used to characterize alkylbenzenes in a complex and relatively well studied sample, diesel exhaust. 14 references, 3 figures, 3 tables.

30269 Charge and spin density waves in charge-transfer solids. Mazumdar, S.; Dixit, S.N.; Bloch, A.N. (Los Alamos National Lab., NM). *Molecular Crystals and Liquid Crystals;* **120**: 35-42(1985).

It is shown that the strength and periodicities of charge and spin density waves in the organic charge-transfer solids depend very strongly on the degree of charge transfer rho. Both the appearance of the 4k/sub F/ charge density wave near rho = 0.5 and its nonexistence for rho $>$ 0.6, are explained; for rho slightly larger (but not smaller) than $\sim$ 0.5 a new kind of Coulomb-induced defect is predicted. 11 references, 1 figure, 1 table.

30270 I. Kinetic and mechanistic study of the [4+4] dimerization of 2,3-dimethylene-2,3-dihydrofuran. II. Preparation of 2,3-dimethylene-2,3-dihydrobenzo[B]furan by the flash vacuum pyrolysis of 2-methyl-3-benzo[B]furylmethyl benzoate. III. Reaction of 2,3-dimethylene-2,3-dihydrofuran with triplet oxygen. Chou, C.H. Ames, IA; Iowa State Univ. (1985). 284p. University Microfilms Order No. 85-14,382.Contract W-7405-ENG-82.

Thesis (Ph. D.).

A kinetic and mechanistic study of the [4+4] dimerization of 2,3-dimethylene-2,3-dihydrofuran (1) has been carried out based on the secondary deuterium kinetic isotope effects (2°D KIE), substituent effects and solvent effects. The 2°D KIE was studied by measuring the rate constants, k_1, k_2, k_3, and K_4, respectively, for the [4+4] dimerization of 1,2-methylene-3-dideuteriomethylene-2,3-dihydrofuran (2), 2-dideuteriomethylene-3-methylene-2,3-dihydrofuran (3) and 2,3-bis(dideuteriomethylene)-2,3-dihydrofuran (4). The relation among k_1-k_4 at -30.0°C was found to be $k_2/k_1 = k_4/k_1 =$

1.86 and $k^1 = k_3$. This result and the insignificant solvent effects that have been observed lead to the conclusion that the [4+4] dimerization of 1 proceeds via stepwise mechanism involving a diradical intermediate. 2,3-Dimethylene-2,3-dihydrobenzo[b]furan (5) was synthesized by the flash vacuum pyrolysis of 2-methyl-3-benzo[b]furylmethyl benzoate. The chemical reactions of 5, which were investigated in this study, include thermal dimerization reactions and Diels-Alder reactions. The dimerization reaction of 5 gave both [4+2] and [4+] dimers. The formation of cyclic peroxides from the reactions of 1 and its 5-methyl and 5-tert-butyl derivatives with triplet oxygen was investigated. Thermolysis of a cyclic peroxide gave dialdehyde, hydroxyl aldehyde and diol as the products.

30271 **Formation of benzene by the pyrolysis of 4-vinylcyclohexene regiospecific formation of anthracenes in the pyrolysis of dibenzosuberones and related systems.** Tunkel, J.L. Ames, IA; Iowa State Univ. (1985). 212p. University Microfilms Order No. 85-14,444.Contract W-7405-ENG-82.

Thesis (Ph. D.).

The thermal rearrangement of the dimer of butadiene, 4-vinyl-cyclohexene, was investigated by flash vacuum pyrolysis (FVP). The FVP of 4-vinylcyclohexene-3,3,5,5,6,6,8,8-d_8 at 800°C gave benzene, which had a statistical deuterium incorporation, as a major product. From the results of the study a new mechanism for the pathway from butadiene to benzene is proposed. Also described is a study on dibenzocyclooctene-5,5,6,6,-d_4 and the isolation and characterization of the minor products produced along with anthracene in the FVP of the dibenzocyclooctene-5,5,6,6-d_4. The VPF of 2,9-dimethyldibenzosuberone gives, as the sole product, 2,6-dimethylanthracene. The regiospecific transformation arises from a 180° ring flip of the two original aromatic nuclei relative to one another. The synthetic utility of this reaction was investigated, and it is a high yield, regiospecific route to difunctionalized anthracenes.

30272 **Electron spin echo studies of donor-doped poly(p-phenylene) and its oligomers.** Kispert, L.D.; Joseph, J.; Bowman, M.K.; van Brakel, G.H.; Tang, J.; Norris, J.R. (Univ. of Alabama, Tuscaloosa). *Molecular Crystals and Liquid Crystals;* **107**: 81-90(1984). Contract W-31-109-ENG-38;AS05-76ER04062.

Electron spin echo (ESE) measurements for T_1 and T/sub m/ were obtained from 4-300 K for potassium and lithium-doped poly(p-phenylene), (PPP), and potassium-doped p-sexiphenyl (6 phi) and p-terphenyl (3 phi). At 300 K, T_1=T/sub m/ for k-PPP; T_1=2T/sub m/ for K-6phi and T_1=10T/sub m/ for K-3phi at the highest possible concentration of donor dopant. T_1 and T/sub m/ are temperature independent between 4 and 300 K. The temperature independence of T_1 and T/sub m/, and T_1-T/sub m/ is attributed to exchange narrowing between anions located on neighboring chains with r<10 A and not to charge carriers of conductivity. 22 references, 4 figures, 1 table.

30273 **Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$.** Edwards, P.G.; Andersen, R.A.; Zalkin, A. (Univ. of California, Berkeley). *Organometallics;* **3**: No. 2, 293-298(1984). Contract AC03-76SF00098.

Reaction of 4 molar equiv of $PhCH_2Li$ with $MCl_4(Me_2PCH_2CH_2PMe_2)_2$ gives $M(CH_2Ph)_4$ ($Me_2PCH_2CH_2PMe_2$), where M is Th or U. Reaction of a mixture of 3 molar equiv of $PhCH_2Li$ and 1 molar equiv of MeLi with $MCl_4(Me_2PCH_2CH_2PMe_2)_2$ gives the unsymmetrical alkyls $M(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, where M is Th or U. The molecular structure of $Th(CH_2C_6H_5)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2C_6H_5)_3Me(Me_2PCH_2CH_2PMe_2)$ were determined by single-crystal X-ray diffraction methods, and the crystal parameters are reported. In the Th complex there are two independent molecules in the unit cell. The Th atoms are each bonded to four benzyl groups and to two phosphorus atoms from the bis(dimethylphosphino)ethane ligand; the average Th-C distance is 2.55 (2) A, and the average Th-P distance is 3.17 (3) A. In the U complex the uranium atom is bonded to a methyl group, three benzyl groups, and the two phosphorus atoms of the bis(dimethylphosphino)ethane ligand. The U-C(methyl) distance is 2.41 (1) A; the average U-C(benzyl) distance is 2.50 (4) A. 23 references, 3 figures, 7 tables.

30274 **Measurement of the dipole moment of a peroxyl radical by microwave dielectric absorption.** Fessenden, R.W.; Hitachi, A.; Nagarajan, V. (Univ. of Notre Dame, IN). *Journal of Physical Chemistry;* **88**: No. 1, 107-110(1984).

The technique of time-resolved microwave dielectric absorption has been used to measure the dipole moment of the benzylperoxyl radical in benzene, cyclohexane, and decane solutions. The radicals were produced by photolysis of dibenzyl ketone in oxygen-containing solutions with pulses of light at 280 nm from a frequency-doubled dye laser. Benzyl chloride and cyanide were used to model the rotational relaxation behavior of the radical. A dipole moment of 2.4 +/- 0.2 D was found. It is suggested that this polarity may be large enough to significantly affect the location of the portion of the molecule bearing the peroxyl group in radicals formed in heterogeneous systems as micelles or bilayers in water. 16 references, 1 figure, 4 tables.

30275 **Luminescence of 1,4-naphthoquinone and the vitamin K system in Shpolskii matrices at 4 K.** Vo-Dinh, T.; Wild, U.P. (Oak Ridge National Lab., TN). *Spectrochimica Acta, Part A: Molecular Spectroscopy;* **40A**: No. 5, 411-418(1984). Contract W-7405-ENG-26.

This work investigates the high-resolution phosphorescence spectra of 1,4-napthoquinone and the vitamin K system in Shpolskii solvents at 4 K. The quasi-linear vibronic bands are discussed with regard to spectral assignments and polarization data. The effect on non-totally symmetric vibrations is also discussed. 26 references, 5 figures, 4 tables.

30276 **Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies.** Wismontski-Knittel, T.; Das, P.K.; Fischer, E. (Univ. of Notre Dame, IN). *Journal of Physical Chemistry;* **88**: No. 6, 1163-1168(1984).

The fluorescence decay of trans (2-anthryl)ethylenes containing phenyl, 2-naphthyl, and 2-thienyl groups as the second substituent is biexponential. The decay profiles in benzene are analyzable in terms of two lifetimes in the ranges 6-11 and 17-30 ns, respectively. The complex decay behavior as well as the observation of excitation wavelength dependence of fluorescence spectra, quantum yields, exciplex emission maxima, and fluorescence quenching constants (with oxygen, ethyl iodide (EtI), and N,N-dimethylaniline (DMA) as quenchers) is attributed to the existence of quasi-energetic rotamers in solutions of (2-anthryl)ethylenes. Exciplex lifetimes and transient absorption spectra of radical anions obtained by nanosecond laser flash photolysis in the presence of N,N-dimethylaniline are also presented. 17 references, 6 figures, 6 tables.

30277 **Molecular secondary ionization source for use with a high performance tandem mass spectrometer.** Todd, P.J.; Glish, G.I.; Christie, W.H. (Oak Ridge National Lab., TN). *International Journal of Mass Spectrometry and Ion Physics;* **61**: 215-230(1984). Contract W-7405-ENG-26.

A secondary ion source has been designed, constructed and mounted to a triple-sector (EBE) mass spectrometer. The intense secondary ion beam produced by the source permits routine tandem mass spectrometry of involatile analytes. The gas phase fragmentation of secondary protonated argenine has been investigated using this instrument. 28 references, 7 figures.

30278 **Synthesis of oxygen-18 enriched phenol and naphthol from $^{18}O_2$.** Walker, T.E.; Goldblatt, M. (Los Alamos National Lab., NM). *Journal of Labelled Compounds and Radiopharmaceuticals;* **21**: No. 4, 353-361(1984).

Phenols enriched with oxygen-18 can be synthesized using an acid exchange reaction in $H_2{}^{18}O$ at elevated temperature, however, to obtain highly enriched products very large quantities of water must be used and recycled. Grignard reagents will react readily with oxygen gas with almost no isotopic dilution to produce the ^{18}O enriched alcohol or phenol. Aromatic Grignards do not produce as high a yield as the aliphatic Grignards, however, both provide convenient routes to labeled products. The yield of naph-

thol from an aryl halide can be improved by the addition of an aliphatic halide (which produces the alcohol as a by product), however, the yield of naphthol from $^{18}O_2$ gas is not improved by this approach. Either 1-bromonaphthalene or bromobenzene was converted into the Grignard reagent and reacted with oxygen-18 enriched gas at 0° in a sealed reaction system. The reaction was worked up in the conventional manner and the yields from $^{18}O_2$ were 34% for [^{18}O] phenol and 23% for 1-[^{18}O]naphthol. 15 references, 1 figure, 1 table.

30279 **Role of geometric distortion in the quenching behaviors of all-trans 1,4-diphenyl-1,3-butadiene triplet.** Chattopadhyay, S.K.; Kumar, C.V.; Das, P.K. (Univ. of Notre Dame, IN). *Journal of Photochemistry;* 26: 39-47(1984).

The quenching behaviors of all-trans 1,4-diphenyl-1,3-butadiene triplet towards azulene, ferrocene, perylene, oxygen and di-tert-butyl-nitroxide were examined in the context of those of several aromatic triplets with comparable spectroscopic triplet energies. The results are explained in terms of distortion of the diene triplet from its planar geometry. 26 references, 2 figures, 2 tables.

30280 **Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten.** Rajan, O.A.; McKenna, M.; Noordik, J.; Haltiwanger, R.C.; DuBois, M.R. (Univ. of Colorado, Boulder). *Organometallics;* 3: No. 6, 831-840(1984).

The synthesis of two new dithiolate complexes of W(III) and (IV) with the formulas $(CpW)_2S_2(SC_2H_4S)$ and $(CpWS)_2(SC_2H_4S)$ where Cp=cyclopentadienyl is described. Structures are proposed for the dimers on the basis of spectral data and by analogy to known molybdenum complexes of similar compositions. The redox characteristics of the new complexes have been established, and the reactivity of the dimers has been compared with that of the known molybdenum cogeners. Crystal structures are presented for the three dimeric complexes formed when $[CpWS(\mu\text{-}s)]_2$ reacts with acetylene. The molecular structures of the complexes are described in detail. The vanadium dimers were also studied, but unlike the molybdenum and tungsten systems, the vanadium dimers showed no evidence of reactivity at the dithiolate ligands. 41 references, 3 figures, 5 tables.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 29904, 30221, 30284, 30291

30281 (N—86-17267, pp vp) **Numerical simulation method for combustion in an oxyhydrogen rocket motor.** Taki, S.; Fuhwara, T. (Nagoya Univ., Japan). 1984. NTIS, PC A14/MF A01. (NAL-SP—3; CONF-8407170—).

From 2. NAL symposium on aircraft computational aerodynamics; Tokyo, Japan (5 Jul 1984).

Numerical simulations of unsteady phenomena in the combustion chamber of an oxyhydrogen rocket motor were made in an attempt to develop a computer code for use in investigating such phenomena as vibrating combustion. The combustion in this system is controlled by diffusion, the effect of which works much slower than sound or pressure waves, so that diffusions are usually solved using the implicit finite difference method for unlimited time step size caused by stability criterion. However, the gases flow so fast, accompanied by unsteady pressure waves, that an explicit method is adopted to solve this problem. The way of modeling the turbulent diffusion combustion is very important in this simulation. The fine structures of turbulence and diffusion flame could not be calculated by a finite difference method because of the limited ability of computers. It is presumed that the size of the space difference should be less than or the same order as that of the small eddies. In the present example of simulation, eddy equations are not solved; rather the reasonable transport coefficients for small eddies are simply used. The results indicate the possibility of numerical simulation of unsteady phenomena in an oxyhydrogen rocket motor, though it is till necessary to make comparisons with experiments to fix some parameters.

30282 **Surface Raman scattering and electrochemistry of iron protoporphyrin IX at a polycrystalline silver electrode.** McMahon, J.J.; Baer, S.; Melendres, C.A. (Williams College, Wiliamstown, MA). *Journal of Physical Chemistry;* 90: No. 8, 1572-1577(10 Apr 1986). Contract W-31-109-ENG-38.

Cyclic voltammetry and laser Raman spectroscopy were used to characterize in situ the behavior of iron(III) protoporphyrin IX (Fe(III)PP) adsorbed at a polycrystalline silver electrode in 0.1 M $Na_2B_4O_7$ electrolyte solution. Modest catalysis of the O_2 reduction reaction in the presence of porphyrin was observed. Reduction of the Fe(III)PP to Fe(II)PP in solution was distinguishable from that of adsorbed hemin. Solution electrochemistry and resonance Raman scattering following reduction suggest that, while dimerization of the reduction product appears to occur in solution, the surface bound species remain monomeric. 21 references, 9 figures, 1 table.

30283 **Raman spectroscopy of polymers of metal protoporphyrin free acids on metal electrodes.** Shelnutt, J.A.; Ginley, D.S. (Sandia National Lab., Albuquerque, NM). *Journal of Physical Chemistry;* 89: No. 25, 5473-5476(5 Dec 1985). Contract AC04-76DP00789.

Free acid Cu, Ni, and Zn, but not Fe(III) and $Sn(OH)_2$, protoporphyrins IX have been oxidatively polymerized via the ring vinyl substituents onto electrode surfaces. Electropolymerization follows a ring oxidation mechanism as previously observed for the protoporphyrin dimethyl esters. Raman spectra of the nickel protoporphyrin polymer films show that vinyl groups are saturated in the polymer as evidenced by the disappearance or shifts in vinyl-dependent vibrations. Appreciable axial ligation of Ni and Cu in the polymer films is also ruled out by the Raman results. Surface enhancement of the Raman scattering is observed for polymer films on silver electrodes but not on platinum and tin oxide electrodes. Differences between the spectra of the first monolayer at the Ag surface and the bulk polymer are slight, but small frequency shifts are detected by applying the Raman difference spectroscopic technique. 24 references, 3 figures, 2 tables.

4005 Photochemistry

REFER ALSO TO CITATION(S) 30173, 30207, 30209, 30235, 30265, 30274, 30275, 30276, 30279, 30313

30284 **Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue.** Kamat, P.V.; Chauvet, J.P.; Fessenden, R.W. (Univ. of Notre Dame, IN). *Journal of Physical Chemistry;* 90: No. 7, 1389-1394(27 Mar 1986).

Chlorophyllin, an analogue of chlorophyll a, when adsorbed on colloidal TiO_2 can participate in the sensitization process by injecting electrons from its excited states into the conduction band of the semiconductor. Upon excitation in its absorption band, 90% of the fluorescence emission of chlorophyllin could be quenched by colloidal TiO_2. The apparent association constant for the association between colloidal TiO_2 and chlorophyllin, as measured from the fluorescence quenching data, was 2×10^4 M^{-1}. Picosecond lifetime measurements gave the rate constant for the electron injection process from the excited singlet state into the conduction band of the semiconductor as 4.2×10^9 s^{-1}. The net charge transfer across the sensitizer-semiconductor interface was investigated with the laser flash photolysis and time-resolved microwave absorption techniques. Analysis of the transient absorption spectrum confirmed the generation of the cation radical of chlorphyllin with a quantum yield of 0.015. 32 references, 8 figures, 1 table.

30285 **Surface-enhanced resonance Raman study of the photoreduction of methylviologen on a p-InP semiconductor electrode.** Feng, Q.; Cotton, T.M. (Univ. of Nebraska, Lincoln). *Journal of Physical Chemistry;* 90: No. 6, 983-987(13 Mar 1986). Contract FG02-84ER13261.

The redox reactions of methylviologen (MV) at a silver electrode and at a p-InP electrode have been studied by cyclic voltammetry and Raman spectroscopy. By deposition of a silver island overlayer onto a p-InP semiconductor electrode the surface en-

hancement effect was obtained, allowing the MV reduction products formed at the semiconductor electrode to be monitored in situ. The photovoltaic response on p-InP electrode was not perturbed by the presence of the silver overlayer. Surface-enhanced resonance Raman (SERR) spectroscopy has verified the adsorption of the products from the reduction reactions $MV^{2+} + e^- \rightarrow MV^+$. and $MV^+. + e^- \rightarrow MV^0$. The Raman spectrum of one-electron and two-electron (MV^0) reduced methylviologen was obtained by exhaustive electrolysis in acetonitrile solution to provide an assignment of the surface spectra. 31 references, 4 figures.

30286 **Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals.** Carr, R.W. Jr.; Peterson, D.G.; Smith, F.K. (Univ. of Minnesota, Minneapolis). *Journal of Physical Chemistry;* **90**: No. 4, 607-614(13 Feb 1986). Contract AC02-76ER02026.

Flash photolysis of 1,3-dichlorotetrafluoracetone through Suprasil and in Ar diluent gave transient spectra due to the 250-nm band system of CF_2. With O_2 present, ClO bands in the 265-292-nm region were observed, and the CF_2 bands were reduced in intensity. Evidence was found that Cl atoms are the precursor to ClO and that $CF_2ClCOCF_2$ is the precursor to CF_2. In the absence of O_2, CF_2 decayed by the bimolecular association reaction, $2CF_2 \rightarrow C_2F_4$. Formation of CF_2 occurs in 25-50 μs, while ClO rises to a maximum in about 200 μs. Both decay over periods of milliseconds. In the presence of O_2, CF_2 decay was greatly accelerated, and the ClO decay was faster than could be accounted for by known reactions and reported rate constants. A bimolecular reaction of CF_2 with ClO was suggested to explain this observation. Evidence that reaction of Cl with CF_2ClO_2 is the most important source of ClO was obtained. Two primary photochemical processes, yielding CF_2Cl radicals and CO, and $CF_2ClCOCF_2 + Cl$, were necessary to adequately explain the results. A detailed mechanism was developed, and numerical simulation employed to fit ClO profiles. The simulation required phi/sub Cl//phi/sub CO/ ~ 0.33. Sensitivity analysis was used to reduce the mechanism to the minimum number of reactions necessary for faithful reproduction of CF_2 and ClO profiles. 28 references, 8 figures, 2 tables.

30287 **Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene.** Smalley, J.F.; Nesbitt, F.L.; Klemm, R.B. (Brookhaven National Lab., Upton, NY). *Journal of Physical Chemistry;* **90**: No. 3, 491-497(30 Jan 1986). Contract AC02-76CH00016.

From International conference on chemical kinetics; Gaithersburg, MD, USA (17-19 Jun 1985).

The branching ratio, α_1, for the $H + C_2H_3O$ product channel of the $O(^3P) + C_2H_3O$ reaction was determined from measured H- and O-atom profiles in this flash photolysis-resonance fluorescence study. The relative detection sensitivity of the system for H and O atoms was determined experimentally. A chemical model was used to describe the reaction mechanism together with the relative detection sensitivity, and a value of $\alpha_1 = 0.27 +/- 0.05$ was derived at 300 K. At higher temperatures, the value of α_1 appears to increase slightly. Possible reasons for this increase are discussed. 30 references, 2 figures, 7 tables.

30288 **Photoinduced C-C bond cleavage via electron-transfer reactions: visible-light-mediated scission of tertiary amines.** Lee, L.Y.C.; Ci, X.; Giannotti, C.; Whitten, D.G. (Univ. of Rochester, NY). *Journal of the American Chemical Society;* **108**: No. 1, 175-177(8 Jan 1986). Contract AC02-84ER13151.

This paper reports the electron-transfer photochemistry of some substituted tertiary amines that contain potentially labile C-C bonds adjacent to the amine. Results are presented which indicate that photoinduced electron transfer can lead to reactions in which the net process involves use of visible light to mediate selective cleavage of C-C bonds to produce radicals. 34 references.

30289 **Enhanced photoredox chemistry in quantized semiconductor colloids.** Nedeljkovic, J.M.; Nenadovic, M.T.; Micic, O.I.; Nozik, A.J. (Boris Kidric Institute of Nuclear Sciences, Belgrade, Yugoslavia). *Journal of Physical Chemistry;* **90**: No. 1, 12-13(2 Jan 1986).

Optical effects due to size quantization have been observed for HgSe, PbSe, and CdSe colloids in water and acetonitrile with particle diameters of 20-100 A. For diameters less than 50 A, the optical absorption edge of HgSe and PbSe is blue shifted by several volts. The results are consistent with perturbation of the semiconductor band structure due to carrier confinement in very small particles resulting in an increase in the effective band gap. The redox potential of photogenerated carriers is greatly enhanced in such quantized semiconductor particles; reduction reactions that cannot occur in bulk materials can occur in sufficiently small particles. This has been demonstrated with H_2 evolution in 50-A PbSe and HgSe colloids and CO_2 reduction in 50-A CdSe colloids. 13 references, 3 figures.

30290 **Vibrational predissociation of SF_6 clusters in a supersonic molecular beam.** Brady, B.B.; Spector, G.B.; Flynn, G.W. (Columbia Univ., New York, NY). *Journal of Physical Chemistry;* **90**: No. 1, 83-87(2 Jan 1986). Contract AC02-78ER04940.

Dimers of SF_6 in a neat molecular beam were predissociated by a low-power, CW CO_2 laser. The dimers were detected by the decrease in energy flux, measured with a bolometer, which occurs when the dissociated particles leave the beam. A model is presented which allows upper and lower limits on the percent dimer in the beam to be determined from the change in bolometer signal upon laser irradiation. The best estimate for the dimer percentage in a neat SF_6 beam at 290 K source temperature, 200 torr backing pressure for the nozzle used in these experiments is 2%-30%. The effects of these results on earlier SF_6 beam experiments are discussed. 21 references, 5 figures.

30291 **Pyridinium quenchers of Ru(bpy)₃2i charge effects of the yield of electron transfer.** Jones, G. II.; Malba, V. (Boston Univ., MA). *Journal of Organic Chemistry;* **50**: No. 26, 5776-5782(27 Dec 1985).

The quenching of the luminescent state of tris(2,2'-bipyridine)ruthenium(II) ($Ru(bpy)_3^{2+}$) by a series of pyridinium ions has been studied. 4-Acetyl-, 4-cyano-, 4-carbomethoxy-, or 4-carboxy-1-methylpyridinium, along with the well-known electron-transfer agent methyl viologen (MV^{2+}), were employed as electron-acceptor quenchers in order to reveal the effects of charge type on the yield of photoinduced electron transfer involving the Ru(II) luminescent state as electron donor. Rates of quenching by the pyridinium ions were measured by using steady irradiation techniques and compared with expectations based on the calculated energetics of electron transfer. Electron transfer yields were obtained by measurement of the transient absorbances of photogenerated radicals (e.g., pyridinyls) using conventional flash photolysis (broad band visible excitation, pH 5, $\mu = 0.5$). The transient photoleaching of $Ru(bpy)_3^{2+}$ by 4-carboxy-1-methylpyridinium was studied by using a Nd:YAG laser with results showing pH control of the charge type and yield of net electron transfer due to in-cage protonation of photogenerated geminate radical pairs. The electrochemical properties of the pyridinium ions were also examined by cyclic voltammetry and a Hammett correlation was made of the reduction potentials.

30292 **Kinetics and mechanisms of electron transfer between blue copper proteins and electronically excited chromium and ruthenium polypyridine complexes.** Brunschwig, B.S.; DeLaive, P.J.; English, A.M.; Goldberg, M.; Gray, H.B.; Mayo, S.L.; Sutin, N. (Brookhaven National Lab., Upton, NY). *Inorganic Chemistry;* **24**: No. 23, 3743-3749(6 Nov 1985). Contract AC02-76CH00016.

The kinetics of the quenching of the long-lived excited states of CrL_3^{3+} and RuL_3^{2+} complexes (L is 1,10-phenanthroline and 2,2'-bipyridine or substituted derivatives) by the copper proteins plastocyanin, azurin, and stellacyanin have been studied in aqueous solution. The rate constants for quenching by the Cu(I) proteins approach a limiting value of ~ 10^6 s^{-1} at high protein concentration. The kinetic behavior for palstocyanin is discussed in terms of a model in which the metal complex binds at a remote site 10-12 A from the copper center. The model allows for electron transfer both from this remote site and by attack of the metal complex adjacent to the copper center. The results show that at low protein

concentration the adjacent pathway is about 10 times faster than the remote pathway. The rate constant for the intramolecular electron transfer from the remote site is consistent with the value expected on the basis of theoretical calculations. 44 references, 5 figures, 3 tables.

30293 **Predissociation and ionization of excited KrXe observed using resonantly enhanced multiphoton ionization-photoelectron spectroscopy.** Pratt, S.T.; Dehmer, P.M.; Dehmer, J.L. (Argonne National Lab., IL). *Chemical Physics Letters;* **116**: No. 2-3, 245-249(3 May 1985).

The heteronuclear rare gas dimer KrXe was examined using resonantly enhanced multiphoton ionization-photoelectron spectroscopy. In addition to photoelectron peaks due to direct photoionization of the KrXe* resonant intermediate state, the spectrum shows a number of peaks due to predissociation of the resonant intermediate state followed by photoionization of the excited atomic fragment. 16 references, 2 figures.

30294 **Optoacoustic detection of photodissociation and thermomolecular recombination in Cl_2.** O'Connor, M.T.; Diebold, G.J. (Brown Univ., Providence, RI). *Journal of Chemical Physics;* **81**: No. 2, 812-819(15 Jul 1984). Contract FG02-84ER13235.

In a spectrophone cell at pressures on the order of 1 atm, photodissociation of a homonuclear diatomic molecule gives two radicals which ultimately recombine in a three-body process to release an amount of heat equal to the energy of the incident photon. If the radiation producing the photodissociation is amplitude modulated, a periodic heating of the gas takes place that gives rise to a sound wave. Since the recombination process that liberates heat is bimolecular in the radical concentration, the equations describing the optoacoustic effect are nonlinear. The nonlinear response causes the phase lag in the acoustic signal to be dependent on the intensity as well as modulation frequency of the incident radiation. Additional phase shifts are caused by heat release from thermalization of the recoil energy of the nascent photofragments and an increase in mole number immediately following photofragmentation. To test the calculated amplitude and phase dependences of the optoacoustic effect produced by photodissociation, experiments with Cl_2 irradiated at a wavelength of 488 nm were done in a nonresonant spectrophone cell. Several effects depending on modulation frequency and radiation intensity were found that are characteristic of the mechanism of energy release in the system. At low frequencies the acoustic phase lag increases with modulation frequency but decreases with light intensity. At high modulation frequencies the component of the acoustic signal from the mole number increase and photofragment recoil dominates the response giving a phase lag that decreases with increasing modulation frequency. 36 references, 7 figures.

30295 **Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3.** Anderman, M.; Kennedy, J.H. (Univ. of California, Santa Barbara). *Journal of the Electrochemical Society;* **131**: No. 1, 21-26(Jan 1984).

Steady-state photooxidation currents at polycrystalline α-Fe_2O_3 electrodes with low band bending were found to depend significantly on the reducing agents present in the electrolyte. Photooxidation of water at low band bending exhibited only transient character. Diffusion-controlled photocurrents for the photooxidation of I^- and $Fe(CN)_6^{4-}$ in acidic solutions, and OH^- in unbuffered neutral solution were observed at an α-Fe_2O_3 RDE and could be fitted to the Levich equation. The steady-state and the transient photocurrents are analyzed and discussed in terms of cathodic back-reaction of intermediate products with conduction band surface forbidden electrons. 22 references, 8 figures.

30296 **Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study.** Battacharyya, S.N.; Das, P.K. (Univ. of Notre Dame, IN). *Journal of the Chemical Society, Faraday Transactions 2;* **2**: No. 80, 1107-1116(1984).

Quantitative kinetic data have been obtained by 337.1 nm laser flash photolysis for the quenching of benzophenone triplet by several amino acids, aminopolycarboxylic acids and their Fe/sup II/, Co/sup II/ and Ni/sup II/ complexes. The efficiency of the resultant photoreduction has been measured in terms of the yield of ketyl radical or radical anion. The amino and aminopolycarboxylic acids (at neutral pH) were better quenchers when complexed with the metal ions. Under basic conditions, for many of the amino acids as well as for triethylamine, the formation of benzophenone radical anion was observed to be a relatively slow process with a timescale longer than that associated with initial triplet quenching; this secondary reduction has been ascribed to electron transfer from aminoalky radicals to the ground state of the ketone. Among a series of metal complexes with a given acid, the triplet quenching rate constants (k/sub q/) and the yields (δ) of ketyl radical increased in the general order: Ni/sup II/ $\leq$ Co/sup II/ $<$ Fe/sup II/; this is explained in terms of increasing exothermicity for charge-transfer interaction with the ketone triplet (for k/sub q/) and for back electron donation in the photogenerated radical pair (for δ). 26 references, 4 figures, 4 tables.

30297 **Laser flash photolytic determination of triplet yields via singlet oxygen generation.** Chattopadhyay, S.K.; Kumar, C.V.; Das, P.K. (Univ. of Notre Dame, IN). *Journal of Photochemistry;* **24**: 1-9(1984).

The efficiency phi/sub Δ/ of the generation of singlet oxygen $^1O_2$* via oxygen quenching of triplets of a number of substrates of photochemical and photobiological interest was studied by 337.1 nm laser flash photolysis using 1,3-diphenylisobenzofuran as the monitor for $^1O_2$*. For all-trans retinal and two polyenals related to retinal as lower and higher homologues the phi/sub Δ/ data agree well with the triplet yields reported in the literature, suggesting that mechanisms involving charge transfer or spin exchange (at twisted configurations) leading to non-production of $^1O_2$* are unimportant in the oxygen quenching of the triplets of these polyenes. Similar conclusions are also drawn for pyrene-1-aldehyde and tris(bipyridine)ruthenium(II) triplets where observation of quantitative production of $^1O_2$* suggests energy transfer to be the dominant pathway. In support of some previous reports, the singlet oxygen yield in benzophenone triplet quenching by oxygen in benzene is found to be much less than unity (0.4). 31 references, 1 figure, 2 tables.

30298 **Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations.** Reichel, L.W.; Griffin, G.W.; Muller, A.J.; Das, P.K.; Ege, S.N. (Univ. of New Orleans, LA). *Canadian Journal of Chemistry;* **62**: 424-436(1984).

It has been shown that radical cations generated by photoinduced electron transfer (ET) in 1,2-diarylethanes, aryl pinacols, and their derivatives undergo fragmentation reactions. In the presence of oxygen oxidative products are obtained. Time-resolved laser flash photolysis and other ancillary techniques have permitted the definition of the mechanisms of certain oxidative processes observed. 61 references, 3 figures, 1 table.

30299 **$O(^3P)$ atoms formation by the photolysis of hydrogen peroxide in alkaline aqueous solutions.** Sauer, M.C. Jr.; Brown, W.G.; Hart, E.J. (Argonne National Lab., IL). *Journal of Physical Chemistry;* **88**: No. 7, 1398-1400(1984).

The quantum yield of $O(^3P)$ atom scavengeable by cyclopentene, $Phi_0(O(^3P))$, in the photolysis of H_2O_2 and HO_2^- with 248-nm light was determined over the pH range 3-12.9. $Phi_0(O(^3P))$ from H_2O_2, determined at pH 3, is (2.6 +/- 0.6) x 10^{-4}. At pH 8.7-12.9, $Phi_0(O(^3P))$ from HO_2^- is essentially constant, within experimental error, at 0.08 +/- 0.015. All of the observations on the effects of pH and the concentrations of cyclopentene, H_2O_2, and HO_2^- are consistent with the formation of $O(^3P)$ and OH^- in a primary photochemical event, with 0.08 $O(^3P)$ per photon absorbed by HO_2^- escaping the cage and undergoing homogeneous reactions with cyclopentene, OH^-, HO_2^-, and H_2O_2. The rate constants derived relative to reaction with cyclopentene are k/sub OH^-/ = 0.040 +/- 0.007, K/sub HO_2^-/ = 0.5 +/- 0.2, and H/sub H_2O_2/ = 0.05 +/- 0.03. 17 references, 2 figures.

30300 Single shot laser multiphoton ionization detection of UF_5 following the 266 nm photodissociation of UF_6. Chou, J.S.; Sumida, D.; Stuke, M.; Wittig, C. (Univ. of Southern California, Los Angeles). *Laser Chemistry;* **1**: No. 1, 1-7(Oct 1982).

By using laser multiphoton ionization and time-of-flight mass filter, nascent uranium pentafluoride has been detected from the 266 nm laser photodissociation of uranium hexafluoride, following a single laser firing. The method can be used to monitor these species under conditions wherein isotopically selective excitation is responsible for the dissociation of uranium hexafluoride. 10 references, 2 figures.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 30250, 30252

30301 Structure and dynamics of olefin radical cation aggregates. Time-resolved fluorescence detected magnetic resonance. Desrosiers, M.F.; Trifunac, A.D. (Argonne National Lab., IL). *Journal of Physical Chemistry;* **90**: No. 8, 1560-1564(10 Apr 1986). Contract W-31-109-ENG-38.

The time-resolved EPR spectra and thus the structure and dynamics of transient hydrocarbon radical cations are obtained by the pulse radiolysis-fluorescence detected magnetic resonance (FDMR) technique. Here the authors report the observation of short-lived radical cations from olefins. FDMR-EPR spectra of radical cations from tetramethylethylene and cyclohexadiene are illustrated. The olefin radical cations, FDMR spectra are concentration-dependent, since dimerization with neutral molecules takes place at higher ($>10^{-2}$ M) olefin concentration. Rate constants for the dimerization reaction are derived and the effect of solvent viscosity on aggregate formation is demonstrated. By monitoring the further reactions of dimer cations the authors have obtained EPR evidence for previously unobserved higher-order (multimer) radical cation aggregates of olefins. 16 references, 5 figures.

30302 Transient phenomena in the pulse radiolysis of retinyl polyenes. 4. Environmental effects on absorption maximum of retinal radical anion. Bobrowski, K.; Das, P.K. (Univ. of Notre Dame, IN). *Journal of Physical Chemistry;* **89**: No. 26, 5733-5738(19 Dec 1985).

The absorption-spectral and kinetic behaviors of radical ions of all-trans-retinal in various solvents have been studied by spectrophotometric pulse radiolysis at room temperature. Upon going from nonpolar and polar-nonprotic solvents to polar-protic ones (alcohols), large hyposochromic shifts occur in the absorption maximum (λ/sub max/) of retinal radical anion. The anion absorption maxima in the alcohols correlate well with solvent dielectric constants. In a number of solvents, parallelism is noted between the energies corresponding to λ/sub max/'s of retinal anion and of solvated electron (the latter at 77 K and room temperature). Transient phenomena associated with the radical anion (λ/sub max/'s = 448-460 nm) and the retinyl alcohol radical (λ/sub max/ = 405 nm) are observed in the course of the pulse radiolysis of retinal in several normal micelles (aqueous). The blue-shifted locations of the anion λ/sub max/'s strongly suggest a polar-protic, alcohol-like nature of the micellar region where the polyenal resides. 35 references, 8 figures, 2 tables.

30303 Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate. Rush, J.D.; Bielski, B.H.J. (Brookhaven National Lab., Upton, NY). *Inorganic Chemistry;* **24**: No. 23, 3895-3898(6 Nov 1985). Contract AC02-76CH00016.

The molybdenum(IV,V) mixed-valence complexes Mo/sup IV/Mo/sup V/O_4L/sub n/$^{2-}$, where L/sub n/ = (EDTA), (L-cyst)$_3$, or (ox)$_2$(H_2O)$_2$, were obtained by pulse-radiolytic reduction of the corresponding Mo/sup V/ complexes with the hydrated electron, e/sub aq/$^-$. The rates of reduction for the various complexes were found to be similar; $k_4 = k_5 = (1.5 +/- 0.5) \times 10^{10}$ $M^{-1}S^{-1}$. The mixed-valence complexes can also be generated by reduction of the parent complexes with Zn^+ ($k_6 \sim k_7 \simeq 5 \times 10^9$ M^{-1} S^{-1}). The Mo(IV,V) mixed-valence complexes absorb weakly in the visible range ($\epsilon \sim$ 300-500 M^{-1} cm^{-1}). While in the absence of oxygen their decay is relatively slow (t/sub 1/2/ ~ 5-10 s) and does not result in Mo(III) product formation, in the presence of O_2 they undergo rapid second-order oxidation ($k \sim 10^8$ M^{-1} s^{-9} back to the Mo(V) complexes. The latter observation suggests that the driving force for regeneration of the Mo/sup V/$_2O_4^{2+}$ unit is sufficient to cause reduction of the ligands in the reduced complex. Substitution of the bridging oxides in the EDTA complex with sulfide does not significantly change the stability of the mixed-valence complex. 18 references, 3 figures.

30304 Pulse radiolysis of cyclohexane: the identity of the high-mobility positive ion. Trifunac, A.D.; Sauer, M.C. Jr.; Jonah, C.D. (Argonne National Lab., IL). *Chemical Physics Letters;* **113**: No. 3, 316-319(18 Jan 1985). Contract W-31-109-ENG-38.

Previous experimental observations and new pulsed radiolysis results concerning the high-mobility positive ion in cyclohexane are examined. Apparent disagreement among these observations concerning the existence of a high-mobility positive ion can be explained if there are two positive ions of major importance in cyclohexane radiolysis. The possibility is examined that the c-$C_6H_{13}^+$ ion has a normal mobility and that hydride transfer or proton transfer, involving c-$C_6H_{11}^+$ or c-$C_6H_{13}^+$ respectively, is responsible for the observed high mobility. 20 references, 3 figures.

30305 Enhancement of neutralization reaction in colloidal ferric hydrous oxide. Vertes, A. (Notre Dame Univ., IN, USA. Radiation Lab.). *Radiation Physics and Chemistry;* **26**: No. 6, 641-645(1985).

Neutralization reaction was investigated in negative ferric hydrous oxide sols. The adsorption isotherm of OH^- ions on the surface of colloidal particles was measured to provide the variation of their charge with pH. Impulse radiolysis generated the reacting ions in the sol. Using a fast DC conductivity setup for detection, a significant increase in the neutralization rate coefficient was found at low OH^- concentrations. The phenomenon was discussed in terms of the theory of diffusion controlled reactions for particles interacting with Coulomb and Yukawa potential.

30306 Effects of alpha irradiation on barium hollandite and nickel-iron spinel. Weber, W.J. (Pacific Northwest Lab., Richland, WA). *Materials Research Society Symposia Proceedings;* **44**: 671-678(1985). Contract AC06-76RL01830.

Barium hollandite and nickel-iron spinel have been irradiated with alpha particles emitted from PuO_2 source in order to simulate the effects from alpha particle emitted in adjacent actinide-containing phases of the SYNROC assemblage. The unit cell of barium hollandite undergoes an apparent volume expansion of several percent and a weak transformation from a tetragonal to a monoclinic structure when irradiated with alpha particles to a fluence of 3 x 10^{30} alphas/m^2 (~0.05 dpa). The spinel structure, however, is sable with respect to alpha irradiation and the irradiation-induced volume expansion of the unit cell is less than 0.2%. The results are compared with available neutron-irradiation data, and the differences in observed behavior discussed. 21 references, 5 figures.

30307 Structure of the σ^* radical anion in irradiated iodoacetamide. Samskog, P.O.; Kispert, L.D.; Kalyanaraman, B. (Univ. of Alabama, Tuscaloosa). *Journal of the Chemical Society, Faraday Transactions 2;* **80**: 267-274(1984).

The structure of the radical anion $CIH_2CONH_2^-$, observed by EPR spectroscopy in single crystals of x-ray-irradiated iodoacetamide at 77 K, has been deduced from the crystal structure of iodoacetamide and INDO calculations using the RHF/CI method. Within experimental errors, the crystallographically determined C-I bond direction in iodoacetamide lies parallel to the previously reported g/sub parallel/, A/sub parallel/(^{127}I) and e^2qQ/sub zz/(^{127}I) directions obtained for the six-line iodo EPR spectrum observed in X-ray radiated iodoacetamide at 77 K. These features suggest the radical responsible is the radical anion. $^-ICH_2CONH_2$ with the unpaired electron located in the σ^* C-I orbital. This assignment also agrees with the INDO results. The best agreement between the INDO and experimental results is obtained when the C-I bond length is increased by 0.33 A. A comparison with the structure of other σ^* radical anions and anion adducts is given. 28 references, 1 figure, 3 tables.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 29424, 30179, 30196, 30273, 30300, 30336, 30662

30308 **(CONF-850836—11) Proposed production of a large (~40μg) sample of ^{254}Es.** Bigelow, J.E.; Alexander, C.W.; King, L.J. (Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 27p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008969.

From American Institute of Chemical Engineers national meeting; Seattle, WA, USA (25 Aug 1985).

A recent workshop sponsored by the National Research Council has made it clear that the key to further substantial progress in heavy element research is the expanded use of 276-day ^{254}Es as target material. Einsteinium-254 has the greatest mass and charge of any nuclide that can be produced in the required multimicrogram quantities in the foreseeable future. Four major laboratories [Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Oak Ridge National Laboratory (ORNL)] active in transplutonium research have collaborated to propose a major new thrust in transplutonium research that will require an order of magnitude more ^{254}Es than is normally available. This project, called LEAP (an acronym for Large Einsteinium Activation Program) has goals of determining the inorganic chemistry and nuclear chemistry and physics of the transeinsteinium elements through atomic number 109, plus a search for superheavy elements. LEAP is based on using ~40-μg of ^{254}Es as a target for heavy-ion accelerators. The Tranuranium Processing Plant (TRU) of the Chemical Technology Division of ORNL has been given the task of determining the feasibility of producing a 40 μg sample of ^{254}Es and, if later requested, of actually producing the sample. This task, which has been under way for several years, is directed toward three areas of investigation: (1) experimental determination of the neutron cross sections of certain transplutonium isotopes important to the production of ^{254}Es; (2) selection of a ^{254}Es production scheme; and (3) development of the necessary hardware, followed by an actual test irradiation. 12 refs., 9 figs., 2 tabs.

30309 (LA—10365-PR, pp 28-29) **Dissolution of uranium oxide materials in simulated lung fluid.** Scripsick, R.C.; Soderholm, S.C. May 1985. NTIS, PC A05/MF A01. File Number DE85016207.

In Occupational health and environment research 1983: Health, Safety, and Environment Division. Progress report.

Depleted uranium (DU) oxide aerosols prepared in the laboratory and collected in the field were tested to characterize their dissolution in simulated lung fluid and to determine how dissolution is affected by aerosol preparation. DU, a by-product of the uranium fuel cycle, has been selected by the US military for use in several types of munitions. During development, manufacture, testing, and use of these munitions, opportunities exist for inhalation exposure to various (usually oxide) aerosol forms of DU. The hazard potential associated with such exposures is closely related to the chemical form, the size of the DU aerosol material, and its dissolution properties. Five DU sample materials produced by exposing uranium alloy penetrators to certain controlled oxidation atmospheres were studied (oxidation temperatures ranged from 500 to 900°C). In addition, two DU sample materials collected in the field were provided by the US Air Force. All sample materials were generated as aerosols and the respirable fraction was separated and collected. Data suggest that under some conditions a rapidly dissolving U_3O_8 fraction may be formed concurrent with the production of UO_2.

30310 **(N—86-16551) Development of tungsten-tantalum generator. Final report.** Leblanc, A.; Babich, J.; Jhingran, S.G. (Baylor Univ., Houston, TX (USA). Coll. of Medicine). 1985. 120p. (NASA-CR—171905). NTIS, PC A06/MF A01.

The purpose of this project was to develop a useable tungsten (W)/tantalum (Ta) generator. Ta-178 is formed following the decay of its parent, W-178 (half-life: 21.7d) and has a half life of 9.3 minutes in turn yielding stable Hf-178. The decay of the parent isotope (W-178) occurs entirely by electron capture to the 9.3 minute Ta-178 state, without feeding the high spin Ta-178 isomer (half life 2.2 hours). In Ta-178 decay, 99.2% of the disintegrations proceed by electron capture and 0.18% by positron emission. Electron capture results in a 61.2% branch to the ground state of Hf-178 and 33.7% to the first excited state at 93 1KeV. The most prominent features of the radionuclide's energy spectrum are the hafnium characteristic radiation peaks with energies between 54.6 and 65.0 KeV. The radiation exposure dose of Ta-118 was calculated to be approximately one-twentieth that of Tc-99m on a per millicurie basis. A twenty-fold reduction in radiation exposure from Ta-178 compared with Tc-99m means that the usual administered dose can be increased three or four times, greatly increasing statistical accuracy while reducing radiation exposure by a factor of five.

30311 **(NAS-NS—3063) Radiochemistry of uranium, neptunium and plutonium: an updating.** Roberts, R.A.; Choppin, G.R.; Wild, J.F. (Mallinckrodt, Inc., St. Louis, MO (USA). Medical Products R and D; Florida State Univ., Tallahassee (USA). Dept. of Chemistry; Lawrence Livermore National Lab., CA (USA)). Feb 1986. 68p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86007600.

This report presents some procedures used in the radiochemical isolation, purification and/or analysis of uranium, neptunium, and plutonium. In this update of the procedures, we have not attempted to discuss the developments in the chemistry of U, Np, and Pu but have restricted the report to the newer procedures, most of which have resulted from the increased emphasis in environmental concern which requires analysis of extremely small amounts of the actinide element in quite complex matrices. The final section of this report describes several schemes for isolation of actinides by oxidation state.

30312 **(NAS-NS—3116) Alpha counting and spectrometry using liquid scintillation methods.** McDowell, W.J. (Oak Ridge National Lab., TN (USA)). 1 Jan 1986. Contract AC05-84OR21400. 115p. NTIS, PC A06/MF A01; GPO Dep. File Number DE86007601.

Nuclear Science Series: radiochemistry technidques.

The material in this report is intended to be a practical introduction and guide to the use of liquid scintillation for alpha counting and spectrometry. Other works devoted to the development of the theory of liquid scintillation exist and a minimum of such material is repeated here. Much remains to be learned and many improvements remain to be made in the use of liquid scintillation for alpha counting and spectrometry. It is hoped that this modest work will encourage others to continue development in the field.

30313 **(ORNL/TM—9958) Reduction of plutonium(IV) using photochemically generated uranium(IV).** Toth, L.M.; Felker, L.K. (Oak Ridge National Lab., TN (USA)). May 1986. Contract AC05-84OR21400. 37p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009911.

The reduction of Pu(IV) using photochemically generated U(IV) has been evaluated as a procedure for possible inclusion in the Savannah River Plant's nuclear fuel reprocessing facility. The "Purex 2nd Uranium Cycle" with feed conditions of 400 g/L U, 1 M HNO_3, and 10^{-3} to 10^{-6} M Pu was identified previously as the most promising stage for application of a photochemical method. Laboratory tests were conducted under similar conditions to determine if the plutonium could be successfully reduced and separated in a two-phase flowing system. The laboratory scale tests, which used primarily a 0.01 M butanol/0.01 M hydrazine reductant combination, demonstrated that reductive stripping of Pu(IV) using photochemically generated U(IV) is a practical method for removing plutonium from the organic phase. The kinetics of the reductive stripping procedure were found to be determined by the mixing rates of the organic and aqueous phases in this simple laboratory-scale system.

30314 **(ORNL/TM—9988) Use of high-pressure ion exchange for the production of gadolinium-153. Status report.** Posey, J.C. (Oak Ridge National Lab., TN (USA)). Apr 1986. Contract AC05-84OR21400. 18p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010062.

A large high-pressure ion-exchange column, which had been designed for the separation of gadolinium from europium, was

tested in the laboratory. Good separations were obtained. Subsequently, columns of the same design were installed in a hot cell and have been used successfully for the separation of gadolinium-153 from irradiated natural europium. The gadolinium-153 production achieved using these columns is substantially greater than that achieved using the previous process. Rapid damage of the resin is a problem and frequent resin changes are required.

30315 **(UCRL—94467) Nuclear chemistry at Rochester.** Blann, M. (Lawrence Livermore National Lab., CA (USA)). 15 Apr 1986. Contract W-7405-ENG-48. 7p. (CONF-8604165—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009892.

From International conference on heavy ion physics; Rochester, NY, USA (21 Apr 1986).

This is a personal account of the contributions of John Huizenga at University of Rochester and of Harry Gove at NSRL. (DLC)

30316 **Synthesis and X-ray structure of $(C_5Me_5)_2Th(\mu\text{-}PPh_2)_2Pt(PMe_3)$: a complex with a thorium-platinum bond.** Hay, P.J.; Ryan, R.R.; Salazar, K.V.; Wrobleski, D.A.; Sattelberger, A.P. (Los Alamos National Lab., NM). *Journal of the American Chemical Society;* **108**: No. 2, 313-315(22 Jan 1986).

The synthesis of $Cp_2^*Th(PPh_2)_2$ (1), and the preparation (eq 1) of $Cp_2^*Th(\mu\text{-}PPh_2)_2Ni(CO)_2$ (2), $Cp_2^*Th(PPh_2)_2 + Ni(COD)_2 + 2CO \rightarrow Cp_2^*Th(\mu\text{-}PPh_2)_2Ni(CO)_2 + 2COD$ (1) the first phosphido-bridged heterobimetallic complex incorporating an actinide element have been reported. The X-ray structure of 2 revealed distorted tetrahedral environments about both metal centers, as well as two unexpected features: (1) acute Th-P-Ni angles which average 76.2 [4]° and (2) a short thorium-nickel separation of 3.206 (2) A. These data led to postulation of the existence of a direct, albeit weak, thorium-nickel interaction, one that could be formulated as a donor-acceptor bond from Ni(0) to the electron-deficient Th(IV) center. Because bonding interactions between actinides (An) and transition metals (M) were unprecedented in discrete complexes, additional experimental evidence was sought for donor-acceptor bonding in $Cp_2^*An(\mu\text{-}PR_2)_2ML/sub\ n/$ systems. Replacement of the $Ni(CO)_2$ fragment of 2 with an electron-rich transition-metal donor was a logical first step toward providing that evidence. Here the synthesis, properties and structure of a new thorium-platinum complex are described and some theoretical insight is provided on the nature of the Th-Pt bond contained therein. 30 references, 2 figures.

30317 **Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$.** Brennan, J.G.; Andersen, R.A.; Robbins, J.L. (Lawrence Berkeley Lab., CA). *Journal of the American Chemical Society;* **108**: No. 2, 335-336(22 Jan 1986). Contract AC03-76SF00098.

Migratory insertion of an anionic group onto coordinate carbon monoxide or an isocyanide is an important mechanistic postulate in organoactinide chemistry. In contrast to transition metals, where carbon monoxide complexes abound, only three examples of carbon monoxide coordination to uranium have been observed in matrix isolation studies at cyrogenic temperatures. These studies showed that $U(CO)_8$ can exist below ca. 20 K and that nu/sub CO/ of 1961 cm^{-1} is similar to that found for $W(CO)_6$, nu/sub CO/ is 1987 cm^{-1} under similar conditions. The nu/sub CO/ is lowered substantially from gaseous CO (nu = 2145 cm^{-1}) which implies that uranium metal is a π-donor, though the bonds are either kinetically labile, thermodynamically weak, or both. In $UF_4(CO)$ the nu/sub CO/ of 2182 cm^{-1} at 20 K/sup 2c/ shows that the tetravalent compound does not engage in π-back-bonding to CO. In another study, UO_2 has been shown to absorb CO at temperatures below 20 K; the CO stretching frequency was not measured. In this paper, evidence is given for $(Me_3SiC_5H_4)_3UCO$, the first molecular actinide complex of carbon monoxide in solution and solid phase. 8 references.

30318 **C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes.** Bruno, J.W.; Smith, G.M.; Marks, T.J.; Fair, C.K.; Schultz, A.J.; Williams, J.M. (Northwestern Univ., Evanston, IL). *Journal of the American Chemical Society;* **108**: No. 1, 40-56(8 Jan 1986). Contract W-31-109-ENG-38.

This contribution reports on the syntheses, structures and cyclometalation reactions of a series of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes of the type Cp'_2ThR_2 ($Cp' = eta^5\text{-}C_5Me_5$). It focuses upon the pathway of C-H $\rightarrow$ C'-H hydrogen atom transfer, hydrogen atom positions in the ground states of $Cp'_2Th(CH_2CMe_3)_2$ by single-crystal neutron diffraction, and those structural/electronic factors influencing reaction rate and regioselectivity in both neopentyl and modified neopentyl complexes. While on the surface the present d^0,f^0 reaction patterns may appear to exhibit similarities to those of the d^0 and related systems, it will be seen that there are actually profound mechanistic differences. It will also be seen that Th-C bond enthalpy data are useful in understanding certain of the reaction patterns. 63 references, 7 figures, 7 tables.

30319 **Preparation and characterization of the first organoactinide polysulfide $(eta^5\text{-}C_5Me_5)_2ThS_5$. A unique example of the twist-boat conformation of the MS_5 ring.** Wrobleski, D.A.; Cromer, D.T.; Ortiz, J.V.; Rauchfuss, T.B.; Ryan, R.R.; Sattelberger, A.P. (Los Alamos National Lab., NM). *Journal of the American Chemical Society;* **108**: No. 1, 174-175(8 Jan 1986).

Polysulfide chelates (S/sub x/$^{2-}$) are an emerging class of inorganic ligands whose reactions are of interest to transition-metal and main-group specialists alike. Stable derivatives have been synthesized for most of the d-block elements, and a wide range of MS/sub x/ ring sizes (x = 2-7, 9) and bonding modes have been established via X-ray crystallography. The reaction chemistry of these transition-metal derivatives is frequently complex, but there are a number of useful synthetic applications such as the high-yield preparations of cyclo-S_6 and -S_7 from Cp_2TiS_5 ($Cp = eta^5\text{-}C_5H_5$) and S/sub x/Cl_2 (x = 1, 2). To date, polysulfido chelates have not been introduced into the coordination spheres of f elements, but this is an obvious extension for the area and an opportunity to study the effects of the larger ionic radii and higher Lewis acidities of f elements on MS/sub x/ ring sizes, conformations, and reactivity patterns. The authors report here the synthesis, properties, and structure of the first actinide polysulfido complex, bis(pentamethylcyclopentadienyl)thorium pentasulfide, and provide some theoretical insight on the nature of the Th(IV)-S_5^{2-} interactions. 20 references, 1 figure.

30320 **Calorimetric studies of curium complexation.** Choppin, G.R.; Liu, Q.; Sullivan, J.C. (Florida State Univ., Tallahassee). *Inorganic Chemistry;* **24**: No. 23, 3968-3969(6 Nov 1985).

The thermodynamics of curium complexation with acetate and EDTA (ethylenediaminetetracetate) are investigated using calorimetry. Calorimetric studies of Eu(III) are presented for comparison. 9 references, 2 tables.

30321 **Wavelengths and energy levels of doubly ionized uranium (U III) obtained using a Fourier-transform spectrometer.** Palmer, B.A.; Engleman, R. Jr. (Los Alamos National Lab., NM). *Journal of the Optical Society of America B: Optical Physics;* **1**: No. 4, 609-625(Aug 1984). Contract W-7405-ENG-36.

The term analysis of complex doubly ionized spectra is made more difficult by the large number of neutral and singly ionized lines that accompany the desired spectra as well as the lack of precision in wavelengths and intensities obtained from conventional spectrographs. To overcome these difficulties, a Fourier-transform spectrometer was used to obtain the spectra of uranium in a hollow cathode filled with a helium-argon mixture or neon. The separation of ion stages was based on the intensity variation of the doubly ionized lines between the two spectra. The wavelength accuracy permitted the first reported determination of energy levels in doubly ionized uranium. 22 low-lying odd levels and 36 high-lying even

levels are reported. The Fourier-transform spectrometer is a useful and appropriate instrument for starting the analysis of complex ionized spectra because of its wavelength and intensity accuracy. 13 references, 4 tables.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 29488, 29489, 30034, 30208

30322 (DOE/ER/02944—9) Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984. Skinner, G.B.; Rao, V.S.; Wood, D.R. (Wright State Univ., Dayton, OH (USA)). Jan 1985. Contract AC02-76ER02944. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009928.

To permit measurements at pressures substantially lower than 2 to 3 atmospheres, in order to study unimolecular falloff, we added an extension to our tube so that measurements could be made behind incident waves. We have studied several reaction systems behind incident waves. These include C_6D_6, and also C_6H_5Cl and C_6H_5Br, which dissociate to form phenyl radicals. A preliminary kinetic analysis suggests that rate constants for benzene and phenyl dissociation both fall off by a factor of about 2 as the total pressure drops from 3 to 0.4 atm. The dissociation of toluene-d_8 was also studied. We have also been studying dissociation of deuterium substituted propenes at low pressures. Two reactions that involve the vinyl radical were also studied at low pressures. Vinyl bromide was dissociated, the results again showing the presence of two dissociation channels. In the second system, H atoms produced by dissociation of toluene were reacted with C_2D_2, the concentrations of both H and D being monitored. We have completed a paper based on measurements made some time ago of N atom line shapes. (PLG)

30323 (EUR—9593) Experimental investigation of the acceleration of deflagration in wake flow. Adomeit, G.; Willms, H. (Commission of the European Communities, Luxembourg). 1983. 122p. NTIS (US Sales Only), PC A06/MF A01. File Number DE86751607.

In gas cloud explosions, turbulence is produced by the flow-field induced by the combustion process. But turbulence can also be produced by an initial flow field, due to atmospheric wind or technical devices. This turbulence may lead to an increased rate of chemical reaction, inducing high pressure levels. The influence of an initial flow field must be taken into account, in connection with safety aspects of nuclear power plants. The reported laboratory-scale experiments were designed to investigate the influence of a flow field, present at the moment of ignition inside a partially-confined hydrocarbon-air cloud. These experiments used a flow channel capable of producing an unsteady flow-field of combustible gas independently of the combustion process itself. The parameters which varied in these tests are: initial flow velocity, gas-mixture composition and geometry. The tests were carried out with stochiometric ethylene-air and propane-air mixtures. The measured quantities are: pressure time history inside the test section. CH-radical radiation. High-speed photographs were also taken. The results show that initial flow speed and reactivity of the mixture have a strong influence on the maximum overpressure and duration of the positive pressure phase, but quenching effects may become important for high flow velocities and mixtures of low reactivity.

30324 (LBL—21299) Intermittency and conditional velocities in premixed conical turbulent flames. Chang, R.K.; Shepherd, I.G. (Lawrence Berkeley Lab., CA (USA); California Univ., Berkeley (USA). Dept. of Mechanical Engineering). Apr 1986. Contract AC03-76SF00098. 20p. (CONF-8604144—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009363.

From Spring meeting of the Western States Section of the Combustion Institute; Alberta, Canada (28 Apr 1986).

A turbulent premixed ethylene/air conical flame in a large Bunsen type burner has been studied using a two-component laser Doppler anemometry (LDA) system. Conditioned reactant velocity statistics were measured using a silicon oil aerosol, which evaporated and burned through the flame fronts, as the LDA seed. The intermittency was also determined by monitoring the Mie scattering intensity from the aerosol. The unconditioned velocity statistics were measured using aluminum oxide particles. A conditional analysis method was developed to deduce the conditioned product velocities. The method is based on deconvolution of the velocity probability density function (pdf). The difference between the conditioned mean product velocity and the conditioned mean reactant velocity, ΔU, within the oblique region of the Bunsen flame is less than that observed previously in v-shaped premixed turbulent flames. The main reason is that combustion induced flow acceleration is lower for the lean test mixture. The conditioned product rms velocities are almost equal to the conditioned reactant rms velocities meaning that flame generated turbulence is not significant. The unconditioned and conditioned covariance (Reynolds stress) are negligibly small through the flame. Since the flame brush is almost parallel to the burner axis, this result is consistent with the covariances for the v-flames after the data was transformed with respect to the flame co-ordinate. 26 refs., 9 figs.

30325 (N—86-17267) Proceedings of the 2nd NAL symposium on aircraft computational aerodynamics. (National Aerospace Lab., Chofu, Tokyo (Japan)). 1984. 321p. (NAL-SP—3; CONF-8407170—). NTIS, PC A14/MF A01.

From 2. NAL symposium on aircraft computational aerodynamics; Tokyo, Japan (5 Jul 1984).

Various topics related to fluid flow are discussed. Supersonic flow, computational fluid dynamics, nozzle flow, axial flow turbines, and fuel combustion are among the topics covered.

30326 (N—86-17267, pp vp) Basic computer code for industrial burner designs. Part 1: capability test in isothermal swirling flows. Eguchi, K.; Fujii, S. 1984. NTIS, PC A14/MF A01. (NAL-SP—3; CONF-8407170—).

From 2. NAL symposium on aircraft computational aerodynamics; Tokyo, Japan (5 Jul 1984).

The capability test of numerical simulation codes is described, focusing on the extensive comparison of LDV data and calculations in axisymmetric isothermal swirling flows which were created by a radial inflow air-swirler for use in a Stirling burner model. The numerical test suggests that as far as mean flow prediction is concerned, our computer code is adequate for Stirling burner design purpose. For further improvement in prediction accuracy of turbulence, the constants used in a standard two-equation turbulence model need to be modified for high temperature swirling flows with recirculation. Besides, additional source terms should be considered to deal with the effect of combustor geometries.

30327 Prediction of heat release effects on a mixing layer. Farshchi, M. (Sverdrup Technology, Inc., Cleveland, OH). pp 14 of Aerospace sciences meeting. Reno, NV; AIAA (1986). (CONF-860130—).

From 24. AIAA aerospace science meeting; Reno, NV, USA (6 Jan 1986).

A fully second-order closure model for turbulent reacting flows is suggested based on Favre statistics. For diffusion flames the local thermodynamic state is related to a single conserved scalar. The properties of pressure fluctuations are analyzed for turbulent flows with fluctuating density. Closure models for pressure correlations are discussed and modelled transport equations for Reynolds streses, turbulent kinetic energy dissipation, density-velocity correlations, scalar moments and dissipation are presented and solved, together with the mean equations for momentum and mixture fraction. Solutions of these equations are compared with the experimental data for high heat release free mixing layers of fluorine and hydrogen in a nitrogen diluent. 25 references.

42 ENGINEERING

REFER ALSO TO CITATION(S) 30032

4201 General Engineering

30328 (K/CSD/INF—86/5) Comparison of a boundary element and finite element solution of an electrochemical plating problem. Giles, G.E.; Gray, L.J.; Wendel, M.W.; Bullock, J.S. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 1986. Contract AC05-84OT21400;AC05-84OS21400. 13p. (CONF-860692—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86007760.

From Boundary element technology conference; Cambridge, MA, USA (17 Jun 1986).

This report presents information on the comparison of two computer modeling methods (boundary element and finite element method) for representing electrochemical plating processes. (JDB)

30329 (RAL—85-006) Low frequency electromagnetic field computation in three dimensions. Trowbridge, C.W. (Rutherford Appleton Lab., Chilton (UK)). Jan 1985. 34p. Rutherford Appleton Lab., Chilton, Didcot, Oxon, England. File Number TI86901153.

Computational modelling is now a basic requirement for the engineer who wishes to design electromagnetic devices. The potential list of end-users of electromagnetic applicable software is enormous, including engineers working on the following applications: equipment and facilities used in physics and engineering requiring magnetic fields of precise shape, for example, charged particle focusing magnets for nuclear physics accelerators, electron beam lithography, and plasma physics containment systems; electromagnetic systems for medical diagnostics such as magnets for nuclear magnetic resonance (NMR) body scanning; probes and evaluation of defects in non-destructive testing equipment; and a multitude of electrical machines and power handling devices of all kinds. In all these cases the designer starts with a performance specification, he then creates from his experience and skill a model which he hopes will go some way toward matching the given specification. In order to test his ideas he needs to predict the performance of his design; first by relatively simple analytic and numerical procedures, and secondly by sophisticated computer techniques, taking account of as many of the design parameters as possible. For many applications two-dimensional simulations are sufficient, but there is an increasing demand for complete three-dimensional solutions in order to minimize the need for building expensive prototypes. Therefore, at the heart of a 'computer aided design' simulation system for an electromagnetic device an algorithm for solving the electromagnetic field equations is required.

30330 (SAND—85-2550C) Control of precious metal plating baths using electrogravimetric analysis. Yelton, W.G. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 13p. (CONF-860677—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86005435.

From 10. international conference on precious metals; Lake Tahoe, NV, USA (8 Jun 1986).

This paper is an outline of an electrogravimetric method for inventory control of precious metal plating baths. The procedure is meant to be applicable to a plating shop environment to provide in-process control. A short review of procedural techniques for sample preparation and analysis are included. The paper deals with the basic "how to" approach for developing a practical system of analytical control of precious metal electroplating baths permitting accountability of 99% or greater.

30331 (UCID—20616) Propagation of long, high-power microwave pulses through the air. Khanaka, G.H.; Yee, J.H. (Lawrence Livermore National Lab., CA (USA)). Mar 1986. Contract W-7405-ENG-48. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009619.

The passage of long, high-power microwave pulses in the atmosphere was studied using a one-dimensional computer code. The objective of this study was to obtain a time history of the electron conductivity and peak density, as well as the peak plasma density. The results are summarized as follows: (1) the threshold level depends on pulse frequency and length; (2) electron avalanche occurs only when the pulse intensity exceeds the threshold level for air break-down, and this results in tail erosion; (3) for higher pulse intensities, it requires less time to initiate electron avalanche, which results in transmitting smaller portions of the pulse; (4) the general characteristics of the electron density, conductivity, and plasma frequency are quite similar for both cases; and (5) as the pulse amplitude rises, the electron conductivity and density and the plasma frequency also rise. 10 figs.

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 29303, 29304, 29306, 29307, 29327, 30110

30332 (BDX—613-3476) Polyimide scale-up in a new facility. Jamieson, D.R. (Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.). Apr 1986. Contract AC04-76DP00613. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010299.

Operations and procedures used in the pilot plant to produce APO-BMI were refined and improved. Equipment modifications resulting in better temperature control at various points in the process were implemented, and techniques used to control the particle size during the precipitation and filtration steps were developed.

30333 (CONF-860604—7) Drop testing at the Oak Ridge National Laboratory. Shappert, L.B.; Box, W.D. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 3p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009450.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

Two different types of packages, the TRUPACT-I shipping system and a TMI-2 defueling canister, were recently subjected to a series of drop tests at the Oak Ridge National Laboratory (ORNL). The testing programs for the two packages are described.

30334 (CONF-860604—8) US DOT Specification 6M radioactive fissile material package nuclear criticality safety re-evaluation. Hopper, C.M. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 3p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009451.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

The details of a recent nuclear criticality safety analysis for the US DOT Specification 6M package is reported. The analysis was performed to meet criteria within the United States Titles 10 and 49 of the Code of Federal Regulations and the International Atomic Energy Agency Safety Series No. 6. The results form the bases for extending previous Fissile Class I (Transport Index = 0.0) package mass limits for specific package sizes. Each of the fissile isotopes ^{233}U, ^{235}U, and ^{239}Pu) were evaluated with four different degrees of water moderation at variable material densities. Also, Fissile Class II (0.1 < transport index < 10.0) package mass limits were determined for the same materials which are applicable to 30-, 55- and 110-gallon 6Ms.

30335 (CONF-860610—1) Subcriticality measurements for two coupled uranyl nitrate solution tanks using ^{252}Cf-source-driven neutron noise analysis methods. Mihalczo, J.T.; Blakeman, E.D.; King, W.T. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86003086.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

The subcriticality of two interacting solution tanks was determined using ^{252}Cf-source-driven neutron noise analysis methods. These experiments were the first test of this method for an interacting system with materials (in this case, uranyl nitrate) typical of nuclear materials in processing plants. The experiments were performed to test the conclusions from previous interaction experi-

ments with uranium metal discs for a fissile system with moderation, and to provide data to test theoretical models for coupled systems. The uranium metal experiments showed that the subcritical neutron multiplication factor, k/sub eff/, could be determined using point kinetics without any correction for spatial effects from measurements with the source and detectors located adjacent to the same cylinder, whereas for source-detector configurations with either the source and/or detectors adjacent to different cylinders, a model which incorporates the coupling is required to obtain subcriticality. In the previous experiments with two coupled uranium metal cylinders, the measurements were performed at frequencies (<50 kHz) much lower than the break frequencies (>1 MHz) for the metal discs. Thus, many aspects of the theory relating to the relationships between various spatial models could not be verified in previous experiments. These measurements and their interpretation have shown that (1) point kinetics interpretation of the measured ratios of spectral densities yields the subcritical neutron multiplication factor when the source and detectors are located in or adjacent to one of the cylinders of uranyl nitrate, and (2) the coupling reactivity can be obtained by incorporating a third neutron detector adjacent to the cylinder without the source using the kinetics model of Difilippo, which includes one additional spatial mode in the direction of the coupling.

30336 **(CONF-860610—7) Glove box operations for transplutonium element production.** Knauer, J.B.; Alexander, C.W.; Wiggins, J.T. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86005385.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

Glove boxes are used in the Transuranium Processing Plant (TRU) at Oak Ridge National Laboratory for (1) completing the final chemical processing steps to isolate and purify the transplutonium elements, (2) packaging transplutonium elements for shipment, (3) preirradiation and postirradiation processing of samples used to produce special transplutonium isotopes in the High Flux Isotope Reactor (HFIR), and (4) conducting special projects, which include providing highly purified transplutonium products in special chemical forms and/or in experimental devices as requested by researchers. During 20 years of operation, the quantities of transplutonium elements produced, and thus the amount of radioactivity handled, have continually increased. At the same time, substantial effort has been expended to reduce personnel radiation exposures. Equipment and techniques have been developed to maintain the desired operational capabilities in the glove boxes while keeping radiation exposures to operating personnel as low as reasonably achievable. Developments have included the design and fabrication of product handling and collection devices, product storage containers, and laminated exterior shields of lead glass, lead acrylic, acrylic sheets, polyethylene, and lead.

30337 **(DOE/ER/45113—2) Magnetic impurities in superconductors. Performance report, July 1, 1985-June 30, 1986.** Ruvalds, J. (Virginia Univ., Charlottesville (USA). Dept. of Physics). 1986. Contract FG05-84ER45113. 26p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010283.

During the first nineteen months of this grant period we have investigated seven primary subjects and have achieved success in completing certain projects and advancing the others toward the goals originally envisaged. Our research has resulted in the publication of eight manuscripts which involved the participation of graduate students, Research Associates and visiting faculty members in our group. In addition, we have submitted four manuscripts for publication, and two of these have been accepted for publication. Our primary efforts in the investigation of critical fields of superconductors have benefited from research in areas with analogous characteristics such as the metals with charge and spin density waves. Recently, the intense experimental efforts in the study of Heavy Fermion superconductors have revealed evidence for a charge density wave in certain alloys, and thus the close relation between these phenomena fits in nicely with our fields of interest. A very interesting observation of antiferromagnetic order and superconductivity in $CePb_3$ induced by an applied magnetic field is another challenge for our investigation which follows naturally from our research on coupled magnetic impurities in superconductors. Representative examples of our results are presented below, and details may be found in the accompanying manuscript reprints and preprints.

30338 **(EUR—9379) Analysis of maintenance and quality assurance measures for the different radioactive materials packagings in the member states of the European Community.** Warniez, P. (Commission of the European Communities, Luxembourg). 1984. 85p. (In French). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751639.

The report presents an inventory on quality assurance for the safety of packagings for radioactive materials transport in 4 countries of the European Community: France, Federal Republic of Germany and United Kingdom. For each country the study includes: the inventory of reference documents and elements of national regulations for quality assurance, organization of quality following at the national level, quality assurance applied to spent fuel casks is examined. A preparatory program was previously submitted to competent authorities and organisms responsible in radioactive materials transport. In conclusion different quality assurance systems are in use but main criteria are found in all systems.

30339 **(FRNC-TH—2128) Contribution to the study of superconducting magnets.** Ciazynski, D. (Paris-6 Univ., 75 (France)). Sep 1983. 154p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE86751319.

The protection study of a Nb_3Sn superconducting magnet with high current density brought new information on the calculus of maximum temperature in the coil, the longitudinal and transversal propagation velocity of the normal zone. It has finally led to realization and using as protection device of a superconducting switch allowing to rapidly "open" the feeding circuit of the magnet and of a secondary circuit magnetically coupled to the magnet to accelerate the decreasing of the current without increasing the maximum voltage at the magnet connections.

30340 **(HEDL-SA—3467-FP) Full scale tests on remote handled FFTF fuel assembly waste handling and packaging.** Allen, C.R.; Cash, R.J.; Dawson, S.A.; Strode, J.N. (Hanford Engineering Development Lab., Richland, WA (USA)). 20 Dec 1985. Contract AC06-76FF02170. 6p. (CONF-860317—38). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009412.

From Waste management '86; Tucson, AZ, USA (2 Mar 1986).

Handling and packaging of remote handled, high activity solid waste fuel assembly hardware components from spent FFTF reactor fuel assemblies have been evaluated using full-scale components. The demonstration was performed using FFTF fuel assembly components and simulated components which were handled remotely using electromechanical manipulators, shielding walls, master slave manipulators, specially designed grapples, and remote TV viewing. The testing and evaluation included handling, packaging for current and conceptual shipping containers, and the effects of volume reduction on packing efficiency and shielding requirements. Effects of waste segregation into transuranic (TRU) and non-transuranic fractions also is discussed. 5 refs., 8 figs.

30341 **(LA-UR—86-1378) Extreme ultraviolet multilayer reflectors.** Scott, M.L.; Arendt, P.N.; Cameron, B.J.; Newman, B.E.; Windt, D.; Cash, W. (Los Alamos National Lab., NM (USA); Colorado Univ., Boulder (USA)). 1986. Contract W-7405-ENG-36. 10p. (CONF-860316—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010194.

From Topical meeting on short wavelength coherent radiation; Monterey, CA, USA (24 Mar 1986).

We have investigated the design, fabrication, and reflectance measurements of a multilayer silver/silicon reflector for use at 58.4 nm. Our results indicate that reflectors in the extreme ultraviolet do not perform as well as predicted due to the presence of surface oxides and other surface contamination layers. In addition, we have found that the correct optical constants for silver have now been published. We find also that these multilayer coatings can be utilized as reflective polarizers in the EUV with an extinction ratio of

75:1 and a throughput of 28% for the s-polarized component of the beam.

30342 **(LBL—19406) Relationship between critical current and microstructure of internal tin wire.** Dietderich, D.R.; Hassenzahl, W.V.; Morris, J.W. Jr. (Lawrence Berkeley Lab., CA (USA)). Aug 1985. Contract AC03-76SF00098. 14p. (CONF-850814—39). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009922.

From Cryogenic engineering conference and international cryogenic materials conference; Boston, MA, USA (12 Aug 1985).

Prior work on internal tin wire has shown that an increase in critical current results when the Nb_3Sn reaction temperatures (650 to 730°C) are preceded by low temperature diffusion heat treatments that distribute the tin. These heat treatments produce a more uniform tin distribution through the niobium filament array before substantial Nb_3Sn formation has occurred. Heat treatments as long as 19 days have been proposed as the optimal heat treatment for the conductor. However, it is possible to substantially reduce the low temperature heat treatment time while retaining the same high critical current. The success of shortened heat treatments may be interpreted on the basis of the Cu-Sn reaction, diffusion kinetics and the Nb_3Sn growth kinetics.

30343 **(LBL-PUB—3054) Electric overhead traveling cranes: procedures for certification, inspection, and preventive maintenance.** (Lawrence Berkeley Lab., CA (USA)). Mar 1986. Contract AC03-76SF00098. 60p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009903.

The purpose of this procedure is to describe the overhead crane maintenance, inspection, and certification procedures in sufficient detail so that an experienced craftsman can perform the required work efficiently and safely. It is expected that job procedures will be standardized, that criteria for satisfactory job performance will be provided, and that responsibilities will be established. Applicable sections of safety standards and codes are given to assist with their compliance and to make possible the use of safe work practices.

30344 **(PNL—5646) Hanford regulated laundry: inventory control and production improvement study.** Hostick, C.J.; Imhoff, C.H.; Levine, L.O. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 47p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009890.

The purpose of this report is to assist the Hanford regulated laundry facility in reducing processing costs and in improving facility performance. Specific problem areas addressed were: no method for determining optimum manpower requirements, resulting in excessive amounts of employee overtime; no buffer inventory available to offset demand peaks, resulting in additional employee overtime and unmet demand; lack of adequate inventory control, resulting in unnecessary inventory costs; and no detailed analysis of the impact of 100% monitoring.

30345 **(SAND—85-1804C) Methods for verifying strain gage installations.** Bateman, V.I.; May, R.A.; Reese, R.T. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 7p. (CONF-860682—2). NTIS, PC A02. File Number DE86009286.

From SEM spring conference on experimental mechanics; New Orleans, LA, USA (8 Jun 1986).

Methods for verifying strain gage installations have been developed for instrumented test structures subjected to hostile mechanical environments including high speed entry into water and earth. The methods include the comparison of the results of multiple static load tests with appropriate analytical predictions and the use of dynamic signature analysis to identify the mode shapes and frequencies of the test structures which are compared with predictions. These methods are used prior to and after the completion of an individual test or test series involving the instrumented test structure. Two examples are shown which describe the approach used and the results obtained.

30346 **(SAND—85-1840C) Estimated burst power requirements for selected SDI missions.** McCulloch, W.H. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 22p. (CONF-860102—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86005438.

From 3. symposium on space nuclear power systems; Albuquerque, NM, USA (13 Jan 1986).

Power requirements are estimated for several candidate missions proposed for the Strategic Defense Initiative. The missions of interest are those requiring large electric power supply and power conditioning systems for space-based directed energy weapons, including electromagnetic launchers, free-electron lasers, and neutral particle beams. In general, the power requirements are determined by working backward from lethality considerations, using preliminary descriptions of weapons performance and of candidate engagement scenarios.

30347 **(SAND—85-7243) Failure assessment techniques to ensure shipping container integrity.** McConnell, P. (Fracture Control Corp., Goleta, CA (USA)). Feb 1986. Contract AC04-76DP00789. 114p. (TTC—0611). NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86009546.

This report discusses several methodologies which may be used to ensure the structural integrity of containment systems to be used for the transport and storage of high-level radioactive substances. For economic reasons, shipping containers constructed of ferritic materials are being considered for manufacture by vendors in the US and Europe. Ferritic show an inherent transition from a ductile, high energy failure mode to a brittle, low energy fracture mode with decreasing temperature. Therefore, formal consideration of means by which to avoid unstable brittle fracture is necessary prior to the licensing of ferritic casks. It is suggested that failure of a shipping container wall be defined as occurring when a flaw extends through the outer wall of the containment system. Crack initiation which may lead to unstable brittle crack growth should therefore be prevented. It is suggested that a fundamental linear elastic fracture mechanics (lefm) approach be adopted on a case-by-case basis, applied perhaps by means of appropriate modifications to ASMA Section III or Section XI. A lefm analysis requires information concerning service temperatures, loading rates, flaw sizes, and applied stresses. Tentative judgments regarding these parameters for typical shipping containers have been made.

30348 **(SAND—86-0051C) Development of a large unyielding target for packaging tests.** Allen, G.C.; Gonzales, A.; Pierce, J.D.; Bruneske, J.D. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 4p. (CONF-860604—6; TTC—0644). NTIS, PC A02/MF A01; GPO Dep. File Number DE86005631.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

A new unyielding target has been developed at SNL under the direction of the Transportation Technology Center. The target has been constructed at the SNL Sol-Se-Mete cable site and will be used for testing Type B and plutonium air-transportable packages. The target is 10.4 m in length, 4.9 m in width and 7.6 m deep with a mass of >900,000 kg. The steel section is 3.1 m by 8.5 m with an average thickness of approximately 0.2 m.

30349 **(SAND—86-0052C) Target hardness comparison to IAEA unyielding target.** Gonzales, A.; Pierce, J.D.; Stenberg, D.R. (Sandia National Labs., Albuquerque, NM (USA); Southwest Engineering Associates, El Paso, TX (USA)). 1986. Contract AC04-76DP00789. 3p. (CONF-860604—5; TTC—645). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86005629.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

Sandia National Laboratories is conducting an ongoing evaluation relating impact target hardness to the IAEA unyielding target. The Target Hardness program includes experimental testing and analytical calculations to compare effects of various targets on a simple model transportation cask. This project will include ex-

periments to compare impacts with more realistic yielding targets. Two types of materials were chosen to represent yielding targets; soil and concrete. Cask responses at impact velocities of 13 m/s, 20 m/s, 27 m/s (44 ft/s, 66 ft/s, 88 ft/s) onto yielding targets were examined against the 9 meter drop velocity of 13 m/s (44 ft/s) onto an unyielding target.

30350 **(SAND—86-0056C) Testing of the DHLW truck shipping cask.** Madsen, M.M.; Uncapher, W.L.; Stenberg, D.R.; Zimmer, A.; Koploy, M.; Schlafer, W. (Sandia National Labs., Albuquerque, NM (USA); GA Technologies, Inc., San Diego, CA (USA)). 1986. Contract AC04-80SF10791;AC04-76DP00789. 2p. (TTC—0590; CONF-860604—4). NTIS, PC A02/MF A01; GPO Dep. File Number DE86005437.

From International symposium on the packaging and transport of radioactive materials (PATRAM '86); Davos, Switzerland (16 Jun 1986).

The Defense High Level Waste (DHLW) truck transportation cask is a type B packaging currently under development by the US Department of Energy. Type B packagings for transporting radioactive materials are required to survive exposures to environments in accordance with provisions of 10 CFR 71. Simulations of the hypothetical accident conditions of impact, puncture, fire (thermal), and water immersion are required. Testing, analysis, or a combination of testing and analysis may be used to demonstrate compliance. In the DHLW cask program a combination of testing and analysis is used to satisfy the hypothetical accident conditions of impacting a fully loaded cask onto an unyielding target after a 9 m free fall and onto a 15-cm diam mild steel pin following a 1-m free fall. The immersion and fire events are treated analytically. The scale selected for the structural test model is one-half. This factor was chosen because it allows direct scaling of all critical cask components and provides adequate space for instrumentation. Test results are used in the Safety Analysis Report for Packaging to support the reference design. This paper describes testing of the model.

30351 **(SAND—86-0916C) Kinematic modelling and graphic simulation of path planning for mobile vehicles.** Palmquist, R.D.; Steele, J.P.H. (Sandia National Labs., Albuquerque, NM (USA); New Mexico Univ., Albuquerque (USA). Dept. of Mechanical Engineering). 1986. Contract AC04-76DP00789. 8p. (CONF-8606112—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009639.

From IASTED modelling and simulation conference; Vancouver, Canada (4 Jun 1986).

This paper discusses ongoing research being done in the modeling and simulation of intelligent mobile vehicles. In order to model the path execution of mobile vehicles, one must first develop the kinematic equations which represent the specific vehicle characteristics. Two types of vehicles discussed in this paper are omni-directional and conventionally steered designs. Significant trade-offs are incurred by the choice of vehicle (e.g., complexity of control versus complexity of design). These trade-offs are presented and discussed in relation to the vehicle's environment. Having formed a proper kinematic model of the vehicle, graphic simulation of path execution can be displayed. Aspects of this simulation include displaying the physical environment and the planned vehicle path. Through utilization of such graphic simulations, greater insight into vehicle performance can be gained.

30352 **(SAND—86-0966C) Reconnection gun.** Cowan, M.; Cnare, E.C.; Duggin, B.W.; Kaye, R.J.; Tucker, T.J. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1986. Contract AC04-76DP00789. 6p. (CONF-8604147—9). NTIS, PC A02. File Number DE86009636.

From 3. symposium on electromagnetic launch technology; Austin, TX, USA (20 Apr 1986).

An electromagnetic launcher called the reconnection gun is introduced. Its potential performance is shown to be superior to that of a modern railgun for projectiles with mass greater than a few hundred grams. It has a "characteristic velocity" which is an order of magnitude lower for much lower energy loss to ohmic heating. Also, it has several advantages for producing higher acceleration including: no barrel, no drop in acceleration with increase in projectile mass, higher peak pressure on the projectile and smaller differences between average and peak pressure. Experimental results and plans for high-performance, multi-stage designs are briefly discussed.

30353 **(UCRL—93600) Vibration damping in externally pressurized gas bearings.** Roblee, J.W.; Mote, C.D. Jr. (Lawrence Livermore National Lab., CA (USA); California Univ., Berkeley (USA)). Jun 1986. Contract W-7405-ENG-48. 7p. (CONF-860651—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86003470.

From International conference on vibration problems in engineering; Xi'an, China (17 Jun 1986).

The damping mechanisms in externally-pressurized gas bearings are investigated. A single-pole, single-zero transfer function is used to describe the dynamic stiffness of these bearings. The benefits of tuning their frequency-dependent damping are discussed and demonstrated experimentally. A type of auxiliary compensation is also shown to alter the dynamic stiffness of these bearings.

30354 **(UCRL—94208) Evaluation and design of a large spacing loop-loop electromagnetic tool.** Harben, P.E.; Rodgers, P.W.; Holladay, G. (Lawrence Livermore National Lab., CA (USA)). Feb 1986. Contract W-7405-ENG-48. 24p. (CONF-8606105—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009713.

From 27. annual logging symposium of the Society of Professional Well Log Analysts; Houston, TX, USA (9 Jun 1986).

This paper investigates the potential use of a large spacing loop-loop electromagnetic logging tool to detect resistivity anomalies as far as 25 meters away from the borehole wall. A three-dimensional whole space electromagnetic modelling code was used to evaluate the response of such a tool to various transmitter and receiver loop orientations, operating frequencies, loop spacings, resistivity contrasts, anomaly sizes and anomaly distances. Anomalies were modeled as finite extent sheets of various thicknesses which terminated before intersecting the borehole wall. It was found that both coplanar and coaxial loop orientations provide strong anomaly response, but the coaxial loop orientation has superior depth penetration and is a less complex tool to design and build. For such a coaxial tool, anomalies could be detected as far from the borehole wall as half the loop spacing. For rock resistivities on the order of 100 ohm-m, contrasts greater than 2:1 and loop spacings of 75 meters the optimal operating frequency is shown to be 10 kHz. At these loop spacings, anomalies must be thicker 10 meters to be detected. It is further shown that for coaxial loops the nature of the response curves allows one to estimate the distance of an anomaly from the borehole wall although no angular location is possible. A coaxial loop-loop electromagnetic tool design that is currently being built is presented. This tool provides for a downhole power supply to a transmitter loop with a magnetic moment between 100 and 1000 A/m^2 that is electrically isolated via a fiber optic link from the variably spaced receiver located above. Signal detection is provided by a high sensitivity lock-in amplifier. The errors are conservatively estimated for this design at 5%. Thus anomalies resulting in a secondary field less than 5% of the primary transmitted field are deemed undetactable. 11 figs.

30355 **Transitional behavior of pulsed dc losses in superconducting solenoids with self-fields greater than B*.** Broach, J.T.; Lee, W.D.; Eaton R. III. (US Army Belvoir Research and Development Center, Fort Belvoir, Virginia 22060-5606). *Journal of Applied Physics;* 59: No. 11, 3803-3806(1 Jun 1986).

Losses were calorimetrically measured for five multilayer superconducting solenoids carrying pulsed dc transport currents. The solenoids, which were wound from commercial NbTi multifilamentary wire, had self-fields of $B^* < B < 15\ B^*$, where B^* is the calculated field for full penetration of the filament. Loss measurements were taken as a function of peak current at a fixed frequency of 10 Hz and as a function of frequency (1-10 Hz) at a peak current of 30 A. The data do not agree with existing full or partial penetration loss models. The range of magnetic fields between the dominance of either full or partial penetration was found to be wider than expected. A model proposed by Ashkin predicted such a region and his technique for loss calculation agrees with the data.

30356 Dump assembly. Goldman, L.H. (to Dept. of Energy). US Patent 4,569,623. 11 Feb 1986. Filed date 6 Dec 1984. vp.

This patent describes a dump assembly. This assembly consists of: a frame, a fixed conduit secured to the frame and having an inlet, a conduit rotatably mounted on the frame. One end of the frame has an outlet alignable with the inlet to form a continuous passage. At the other end of the rotatable conduit for securing an open ended upright container there is a closure assembly comprised of overlapping plates affixed to the inlet and outlet of the fixed and rotatable conduits, respectively. These plates have openings normally offset from each other to block flow therethrough, and mechanism for rotating the rotatable conduit to invert and raise the container and align the openings to permit flow of material by gravity from the container through the aligned openings.

30357 Permanent magnet multipole with adjustable strength. Halbach, K. (to The United States of America as represented by the United States Department of Energy). US Patent 4,549,155. 22 Oct 1985. Filed date 20 Sep 1982. vp.

PAT-APPL-420433.

Two or more magnetically soft pole pieces are symmetrically positioned along a longitudinal axis to provide a magnetic field within a space defined by the pole pieces. Two or more permanent magnets are mounted to an external magnetically-soft cylindrical sleeve which rotates to bring the permanent magnets into closer coupling with the pole pieces and thereby adjustably control the field strength of the magnetic field produced in the space defined by the pole pieces. The permanent magnets are preferably formed of rare earth cobalt (REC) material which has a high remanent magnetic field and a strong coercive force. The pole pieces and the permanent magnets have corresponding cylindrical surfaces which are positionable with respect to eqch other to vary the coupling therebetween. Auxiliary permanent magnets are provided between the pole pieces to provide additional magnetic flux to the magnetic field without saturating the pole pieces.

30358 Multistrand superconductor cable. Borden, A. R. (to The United States of America as represented by the Department of Energy). US Patent 4,529,837. 16 Jul 1985. Filed date 8 Mar 1984. vp.

PAT-APPL-587438.

Improved multistrand Rutherford-type superconductor cable is produced by using strands which are preformed, prior to being wound into the cable, so that each strand has a variable cross section, with successive portions having a substantially round cross section, a transitional oval cross section, a rectangular cross section, a transitional oval cross section, a round cross section and so forth, in repetitive cycles along the length of the strand. The cable is wound and flattened so that the portions of rectangular cross section extend across the two flat sides of the cable at the strand angle. The portions of round cross section are bent at the edges of the flattened cable, so as to extend between the two flat sides. The rectangular portions of the strands slide easily over one another, so as to facilitate flexing and bending of the cable, while also minimizing the possibility of causing damage to the strands by such flexing or bending. Moreover, the improved cable substantially maintains its compactness and cross-sectional shape when the cable is flexed or bent.

30359 Some novel concepts in fracture mechanics. Anderson, W.E. (Pacific Northwest Lab., Richland, WA). *Journal of the Aeronautical Society of India;* **36**: No. 3, 145-152(Aug 1984). Contract AC06-76RL01830.

Mechanical damage from cycling loads accumulated at a crack tip has correlated with the fluctuating stress intensity factor in a useful way. Hence, structural cracking from mechanical loadings can be very well predicted from test data obtained on different configurations than the structural element; uniqueness of the crack tip stress field provides the unifying characteristic. Fracture mechanics problems are addressed by describing some approaches which can be called novel, if not new. One area involves the kind of cracking data that can be obtained by thinking about the problem from a standpoint of mechanisms and then imagining what kinds of testing parameters should be altered or adjusted to explore the consequences of service-varied exposures. Of particular concern are those situations which might cause an unexpectedly rapid loss of structural integrity. The other area involves test specimen configurations. It is shown that there are a range of specimen configurations which might be employed persuasively to allay design concerns about the effects of stress field contours on cracking behavior.

30360 Experiment to determine properties of packed particle beds and regenerators at cryogenic temperatures. Barclay, J.A.; Overton, W.C. Jr.; Stewart, W.F.; Sarangi, S. (Los Alamos National Lab., NM). *Advances in Cryogenic Engineering;* **29**: 605-612(1984).

The testing of the properties of packed-particle beds and regenerators at cryogenic temperatures as low as 4 K is an essential part of the magnetic refrigeration research and development program at the Los Alamos National Laboratory. Magnetic refrigeration and heat pump systems are envisioned to operate in various ranges from 4 K to ambient temperature and above. Only pressurized helium gas appears suitable as the heat exchange fluid for the low-temperature applications. Because published data on the properties of porous beds at low temperatures are sparse, it was necessary to develop an experimental test apparatus to study the properties of various configurations of beds and regenerators. Two of the well-known methods for such studies are the steady-enthalpy-flux method and the single-blow transient method. The experimental apparatus is described and the results and analysis of recent measurements on packed-particle beds in the liquid helium and liquid nitrogen temperature ranges are presented.

4203 Lasers

REFER ALSO TO CITATION(S) 30115, 30212, 30968, 30977, 31078, 31092

30361 (BNL—37898) Transverse correlations in start-up of a free electron laser from noise. Yu, L.H.; Krinsky, S. (Brookhaven National Lab., Upton, NY (USA)). Mar 1986. Contract AC02-76CH00016. 12p. (CONF-860316—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009917.

From Topical meeting on short wavelength coherent radiation; Monterey, CA, USA (24 Mar 1986).

Linearized Vlasov-Maxwell equations are used to derive a partial differential equation determining the 3-dimensional slowly varying envelope function of the radiated electric field. The equation is solved analytically. From the correlation function $<E(z,r,t)\,E^*(z',r',t)>$ of the electric field averaged over the stochastic ensemble describing the initial shot noise in the beam, we compute the longitudinal and transverse correlation lengths σ/sub L/ and σ/sub T/. The radiated power S per unit cross-sectional area of the the electron beam is determined. Our analysis is applicable for wiggler length L = N/sub w/λ/sub w/ long enough for the exponential regime to be researched, but short enough so that L σ/sub θ/ $\leq$ a, the electron beam radius. 6 refs.

30362 (LA-UR—86-996) Evolution of free-electron laser development. Newman, B.E. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 21p. (CONF-860117—9). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008748.

From Los Angeles symposium and exhibition on optical and electro-optical engineering; Los Angeles, CA, USA (19 Jan 1986).

Recent experimental demonstrations of free-electron laser oscillators and amplifiers have verified the feasibility of these broadly tunable photon sources. We review the current status and their continuing evolution toward ever higher output power and shorter wavelengths. 46 refs.

30363 (LA-UR—86-1420) Gain physics of rf-linac-driven xuv free-electron lasers. Goldstein, J.C.; McVey, B.D.; Newnam, B.E. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 22p. (CONF-860316—6). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010201.

From Topical meeting on short wavelength coherent radiation; Monterey, CA, USA (24 Mar 1986).

In an rf-linac-driven xuv free-electron laser oscillator, the gain depends on the details of the shape of the electron beam's phase-space distribution, particularly the distribution of electrons in the transverse (to the direction of propagation) position and velocity coordinates. This strong dependence occurs because the gain in this device is inhomogeneously broadened. Our previous theoretical studies have assumed that the transverse phase space distribution is a product of uncorrelated Gaussian functions. In the present work, we shall present the results of a theoretical study of the gain for non-Gaussian phase-space distributions. Such distributions arise either from a better representation of the electron beam from an rf-linac or from an emittance filter applied to the beam after the linac.

30364 **(N—86-17731) Theoretical studies of resonance enhance stimulated raman scattering (RESRS) of frequency doubled Alexandrite laser wavelengths in cesium vapor. Semiannual report.** Lawandy, N.M. (Brown Univ., Providence, RI (USA)). Jan 1986. 10p. NTIS, PC A02/MF A01.

It is well known that the presence of a real atomic level which is nearly resonant with the pump field can greatly enhance the Raman emission cross section. In order to accurately calculate the Raman gain in systems where resonance enhancement plays a dominant role, expressions for the pump and signal susceptibilities must be derived. These expressions should be valid for arbitrary field strengths in order to allow for pump and signal saturation. In addition, the theory should allow for arbitrary longitudinal and transverse relaxation rates. This latter point is extremely vital for three level atomic systems such as the alkali earth metals since they do not have population reservoirs and can have widely varying spontaneous lifetimes on the three pertinent transitions. Moreover, the dephasing rates are strong functions of electron states and are therefore also different for the three coupled pairs of levels. These considerations are not as important when molecular systems are concerned since the large reservoir of rotational states serve to produce essentially equal longitudinal recovery rates for the population of the three levels. The three level system with three arbitrary longitudinal and transverse relaxation rates was solved. There is no need for setting either pair of rates equal and the expressions are valid for arbitrarily strong fields.

30365 **Possibilities for achieving x-ray lasing action by use of high-order multiphoton processes.** Clark, C.W.; Littman, M.G.; Miles, R.; McIlrath, T.J.; Skinner, C.H.; Suckewer, S.; Valeo, E. (Radiation Physics Division, National Bureau of Standards, Gaithersburg, Maryland 20899). *Journal of the Optical Society of America B: Optical Physics;* 3: No. 3, 371-378(Mar 1986).

We consider some possible mechanisms for producing gain in the 10-nm spectral region. They involve the creation of a population inversion in a confined plasma column by selective excitation of multiply charged ions through absorption of many (>10) ultraviolet photons. Calculations of the energy-level structure of ions in the Kr isoelectronic sequence show singly and multiply excited states that provide suitable strong radiative transitions in the region of 10-nm. The potential for achieving x-ray lasing action in Kr-like ions pumped by a KrF excimer laser is most favorable at high Z.

30366 **Scattering apodizer for laser beams.** Summers, M. A.; Boyd, R. D.; Hagen, W. F. (to The United States of America as represented by the United States Department of Energy). US Patent 4,537,475. 27 Aug 1985. Filed date 1 Apr 1983. vp.

PAT-APPL-481411.

A method is disclosed for apodizing a laser beam to smooth out the production of diffraction peaks due to optical discontinuities in the path of the laser beam, sich method comprising introduction of a pattern of scattering elements for reducing the peak intensity in the region of such optical discontinuities, such pattern having smoothly tapering boundaries in which the distribution density of the scattering elements is tapered gradually to produce small gradients in the distribution density, such pattern of scattering elements being effective to reduce and smooth out the diffraction effects which would otherwise be produced. The apodizer pattern may be produced by selectively blasting a surface of a transparent member with fine abrasive particles to produce a multitude of minute pits. On one embodiment, a scattering apodizer pattern is employed to overcome diffraction patterns in a multiple element crystal array for harmonic conversion of a laser beam. The interstices and the supporting grid between the crystal elements are obsecured by the gradually tapered apodizer pattern of scattering elements.

30367 **Q-switched raman laser system.** George, E. V. (to The United States of America as represented by the United States Department of Energy). US Patent 4,538,274. 27 Aug 1985. Filed date 4 Jan 1983. vp.

PAT-APPL-455445.

Method and apparatus for use of a Raman or Brillouin switch together with a conventional laser and a saturable absorber that is rapidly bleached at a predetermined frequency $\nu=\nu$ /SUB o/ , to ultimately produce a Raman or Brillouin pulse at frequency $\nu=\nu$ /SUB o/ + or -ν /SUB Stokes/ .

30368 **Inductive gas line for pulsed lasers.** Benett, W. J.; Alger, T. W. (to The United States of America as represented by the United States Department of Energy). US Patent 4,538,277. 27 Aug 1985. Filed date 29 Sep 1982. vp.

PAT-APPL-426435.

A gas laser having a metal inlet gas feed line assembly shaped as a coil, to function as an electrical inductance and therefore high impedance to pulses of electric current applied to electrodes at opposite ends of a discharge tube of a laser, for example. This eliminates a discharge path for the laser through the inlet gas feed line. A ferrite core extends through the coil to increase the inductance of the coil and provide better electric isolation. By elimination of any discharge breakdown through the gas supply, efficiency is increased and a significantly longer operating lifetime of the laser is provided.

30369 **Resonantly enhanced method for generation of tunable, coherent vacuum ultraviolet radiation.** Glownia, J. H.; Sander, R. K. (to The United States of America as represented by the Department of Energy). US Patent 4,529,944. 16 Jul 1985. Filed date 29 Jun 1982. vp.

PAT-APPL-393251.

Carbon Monoxide vapor is used to generate coherent, tunable vacuum ultraviolet radiation by third-harmonic generation using a single tunable dye laser. The presence of a nearby electronic level resonantly enhances the nonlinear susceptibility of this molecule allowing efficient generation of the vuv light at modest pump laser intensities, thereby reducing the importance of a six-photon multiple-photon ionization process which is also resonantly enhanced by the same electronic level but to higher order. By choosing the pump radiation wavelength to be of shorter wavelength than individual vibronic levels used to extend tunability stepwise from 154.4 to 124.6 nm, and the intensity to be low enough, multiple-photon ionization can be eliminated. Excitation spectra of the third-harmonic emission output exhibit shifts to shorter wavelength and broadening with increasing CO pressure due to phase matching effects. Increasing the carbon monoxide pressure, therefore, allows the substantial filling in of gaps arising from the stepwise tuning thereby providing almost continuous tunability over the quoted range of wavelength emitted.

30370 **Efficient generation of tunable radiation below 100 nm in krypton.** Bonin, K.D.; Morris, M.B.; Mcilrath, T.J. (Maryland Univ., College Park). pp 349-355 of Laser techniques in the extreme ultraviolet; Proceedings of the Second Topical Meeting, Boulder, CO, March 5-7, 1984. Harris, S.E.; Lucatorto, T.B. New York, NY; American Institute of Physics (1984). (CONF-840387—).

From 2. topical meeting on laser techniques in the extreme ultraviolet; Boulder, CO, USA (5 Mar 1984).

The utilization of two-photon resonantly enhanced four-wave mixing in krypton to produce tunable VUV radiation below 100 nm is examined. The laser driving system, which contains a Nd:YAG laser and two dye lasers, and the VUV generation cell and detection apparatus used in the experiment are described. The dependence of the VUV intensity on the tunable near IR beam input and the UV input beam is analyzed. The relation between VUV intensity and krypton pressure is studied. The data reveal that a two-photon resonance in krypton is applicable for the generation

of tunable VUV below 100 nm and a maximum efficiency of 0.00001 is achieved. 7 references.

30371 **Soft X-ray source based on a low divergence, high repetition rate ultraviolet laser.** Crawford, E.A.; Hoffman, A.L.; Milroy, R.D.; Quimby, D.C.; Albrecht, G.F. (Mathematical Sciences Northwest, Inc., Bellevue, WA). pp 409-415 of Laser techniques in the extreme ultraviolet; Proceedings of the Second Topical Meeting, Boulder, CO, March 5-7, 1984. Harris, S.E.; Lucatorto, T.B. New York, NY; American Institute of Physics (1984). (CONF-840387—).

From 2. topical meeting on laser techniques in the extreme ultraviolet; Boulder, CO, USA (5 Mar 1984).

The CORK code is utilized to evaluate the applicability of low divergence ultraviolet lasers for efficient production of soft x-rays. The use of the axial hydrodynamic code wih one ozone radial expansion to estimate radial motion and laser energy is examined. The calculation of ionization levels of the plasma and radiation rates by employing the atomic physics and radiation model included in the CORK code is described. Computations using the hydrodynamic code to determine the effect of laser intensity, spot size, and wavelength on plasma electron temperature are provided. The x-ray conversion efficiencies of the lasers are analyzed. It is observed that for a 1 GW laser power the x-ray conversion efficiency is a function of spot size, only weakly dependent on pulse length for time scales exceeding 100 psec, and better conversion efficiencies are obtained at shorter wavelengths. It is concluded that these small lasers focused to 30 micron spot sizes and 10 to the 14th W/sq cm intensities are useful sources of 1-2 keV radiation. 8 references.

30372 **Photoionization lasers pumped by broadband soft-X-ray radiation from laser-produced plasmas.** Silfvast, W.T.; Wood, O.R.,II; Macklin, J.J.; Lundberg, H. (AT&T Bell Labs., Holmdel, NJ). pp 427-436 of Laser techniques in the extreme ultraviolet; Proceedings of the Second Topical Meeting, Boulder, CO, March 5-7, 1984. Harris, S.E.; Lucatorto, T.B. New York, NY; American Institute of Physics (1984). (CONF-840387—).

From 2. topical meeting on laser techniques in the extreme ultraviolet; Boulder, CO, USA (5 Mar 1984).

Large population inversions have been obtained in Cd and Zn ions using broadband soft-X-ray radiation from laser-produced plasmas to photoionize and thereby remove inner-shell d-electrons from the neutral atoms. This technique has presently produced lasers in the ultraviolet, visible, and near infrared. The use of optical pumping to transfer the population produced by photoionization to higher lying levels may produce VUV and XUV lasers in the same and other species. Gains as high as 40 per cm and inversion densities as high as 10 to the 15th per cu cm have already been observed. These large inversions suggest that extractable energies approaching 1 mJ/cu cm may be possible for directly-pumped lasers operating in the visible and for transfer-pumped lasers operating at shorter wavelengths. 12 references.

30373 **Dynamical aspects of the picosecond x-ray generation from laser-produced plasmas.** Kuroda, H.; Nakano, N. (National Laboratory for High Energy Physics, Tsukaba, Japan; Tokyo Univ., Japan). pp 437-448 of Laser techniques in the extreme ultraviolet; Proceedings of the Second Topical Meeting, Boulder, CO, March 5-7, 1984. Harris, S.E.; Lucatorto, T.B. New York, NY; American Institute of Physics (1984). (CONF-840387—).

From 2. topical meeting on laser techniques in the extreme ultraviolet; Boulder, CO, USA (5 Mar 1984).

Picosecond x-ray generation from picosecond produced plasmas is studied. The dependence of the intensities of continuum x-rays on atomic number is analyzed, by utilizing the transient collisional radiative model. The intensities of x-ray lines are calculated in order to investigate the relation between multiply-ionized ions and electron densities and temperatures. It is observed that electron densities and temperatures do not maintain a steady-state equilibrium. The ionizing and combining phases of plasmas are described. An experiment demonstrating picosecond x-ray spectroscopy is presented. 23 references.

30374 **Experimental and simulation studies on soft-X-ray emission from 0.53 micron-laser irradiated solid targets.** Mochizuki, T.; Yabe, T.; Okada, K.; Yamanaka, C. (Osaka Univ., Suita, Japan). pp 449-460 of Laser techniques in the extreme ultraviolet; Proceedings of the Second Topical Meeting, Boulder, CO, March 5-7, 1984. Harris, S.E.; Lucatorto, T.B. New York, NY; American Institute of Physics (1984). (CONF-840387—).

From 2. topical meeting on laser techniques in the extreme ultraviolet; Boulder, CO, USA (5 Mar 1984).

Spectrum-resolved radiant energy for various plane targets are examined. The experimental conditions and analysis of the x-ray emissions are described. The radiant energy spectrum from Au plasmas is studied in terms of the blackbody spectrum and different radiation temperatures; it is observed that the radiant energy spectrum deviates from the blackbody spectrum. The dependence of the x-ray conversion efficiency in Au plasmas on laser intensity is analyzed; conversion efficiency increases as laser pulse duration increases. A hydrodynamic code coupled with the nonlocal thermodynamic equation ion model are utilized to investigate the dynamics of x-ray generation in laser produced plasmas. Electron temperature and ion density profiles, and emitted spectra of Au plasma are calculated. It is concluded that temperature and density stimulate x-ray generation. The interaction of intense soft x-ray radiation with solid matter is studied. 11 references.

30375 **High resolution laser spectroscopy of Xe(5p6 to 5p5 11s-prime) at 94.2 nm.** Bonin, K.D.; Morris, M.B.; Mcilrath, T.J. (Maryland Univ., College Park). pp 502-508 of Laser techniques in the extreme ultraviolet; Proceedings of the Second Topical Meeting, Boulder, CO, March 5-7, 1984. Harris, S.E.; Lucatorto, T.B. New York, NY; American Institute of Physics (1984). (CONF-840387—).

From 2. topical meeting on laser techniques in the extreme ultraviolet; Boulder, CO, USA (5 Mar 1984).

The present investigation is concerned with the use of tunable coherent radiation near 94.2 nm for high resolution spectroscopic studies of autoionizing transitions in Xe. The conducted experiments show that narrowband, tunable, extreme ultraviolet (XUV) radiation below 100 nm can be used to obtain profiles of absorption and ionization features in atoms with a resolution near the Doppler limit. Furthermore, the use of high accuracy wavemeters with the visible driving radiation allows measurements of absolute XUV wavelengths with an accuracy which is similar to that of the best classical techniques. An Xe 11s-prime autoionizing resonance energy level diagram with relevant linewidths from present experiments is provided, and xenon photoionization cross sections are shown. 5 references.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 29253, 30036, 30325, 30327

30376 **(CEA-CONF—8149) TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum.** Magnaud, J.P.; Rouzaud, P. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Sep 1985. 15p. (CONF-8509165—3). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751343.

From International symposium on refined flow modeling and turbulence measurements; Iowa City, IA, USA (16 Sep 1985).

TRIO is a code developed at CEA to investigate general incompressible 2D and 3D viscous flows. Two calculations are presented: the lid driven cubic cavity at Re=400; steady state (velocity and temperature field) of a LMFBR hot plenum, carried out in order to prepare the calculation of a cold shock consecutive to a reactor scram. 8 refs., 26 figs.

30377 **(DOE/SF/12197—T6) Single-substance, two-phase duct flow: a unified theoretical and experimental study.** Nikitopoulos, D.E.; Maeder, P.F. (Brown Univ., Providence, RI (USA). Div. of Engineering). Feb 1986. Contract AC03-84SF12197. 199p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86009828.

The dissertation presents a derivation of basic conservation equations for each phase (a "two fluid model"). The analysis assumes one-demensional, steady-state two-phase flow of a single substance in a variable cross-sectional area duct of arbitrary orientation. The equations are used to examine and explain the phenomenon of "slip" (phases moving at different velocities). 97 refs., 13 figs.

30378 **(DP-MS—85-140) Modeling of convective mixing downstream of separately heated annuli.** Pepper, D.W.; Watterberg, P.A. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1986. Contract AC09-76SR00001. 10p. (CONF-860612—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE86008902.

From 4. AIAA/ASME thermophysics and heat transfer conference; Boston, MA, USA (2 Jun 1986).

Mixing of fluid streams emitted from four adjacent annular regions at different temperatures is numerically modeled using a finite technique. The flow is axisymmetric and incompressible; the Reynolds number ranges from 10 to 1000. A pseudo-velocity formulation based on the SIMPLE algorithm is used to solve for the pressure-velocity coupling in the primitive equations of motion. A fairly well defined mixing zone develops below the inner channels; very little mixing occurs below the outer channel. Reversing the configuration of the annuli is suggested to improve mixing of the outer stream with the inner streams. 22 refs.

30379 **(EUR—10075) Study of rewetting and quench phenomena by single pin out-of-pile experiments, with special emphasis on the effect of pin composition.** Kaiser, N.E.; Rathmann, O. (Commission of the European Communities, Luxembourg). 1985. 82p. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780452.

A series of comparative experiments with single electrically heated fuel pin simulators of different compositions is performed under identical boundary conditions simulating emergency core cooling by reflooding. Three types of pins are used. A hollow tube heated directly by Joule heating, an indirectly heated rod with an internal heater and the space between the heater and the cladding filled with aluminaoxide powder, and finally another indirectly heated rod with the space filled with UO_2 ring pellets, simulating very closely a real fuel rod. The pins are tested in the same test rig. The outer dimensions of the pins are identical for all three pins, 12 mm diameter and a heated length of 4 m. The pins are placled in a circular shroud with an internal diameter of 22 mm, leaving an annular space of a width of 5 mm for the coolant flow. The shroud can be heated to simulate an array of surrounding pins and to avoid cold wall effects. The test paramters are: initial temperature 600-800°C, liquid flow rate at the inlet 1-10 cm/s, system pressure 1-10 bar. The experimental results have been compared to calculations with the computer code NORCOOL-II. A rather good agreement have been achieved between experiments and calculations for a wide range of parameters (rod composition, flow rate, system pressure).

30380 **(Juel—2013) Application of the finite element method to problems with heat radiation exchange.** Breitbach, G.; Altes, J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Sicherheitsforschung). Jul 1985. 33p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751634.

The calculation of temperature distributions for systems exchanging heat radiation requires in a first step the determination of the heat fluxes caused by radiation at its surfaces. In this paper the radiation transport equation is developed and it is shown, that it can be derived from a variational principle. The functional of the variational principle is the starting point of a numerical solution method. By using Finite Element Procedures a system of linear equations is derived, which supplies an approximation of the radiosity. Having the radiosity the heat flux at the surfaces, which governs as the boundary condition the temperature distribution in the structure, can be calculated.

30381 (N—86-17267, pp vp) **Development of computational fluid dynamics at NASA Ames Research Center.** Inouye, M. 1984. NTIS, PC A14/MF A01. (NAL-SP—3; CONF-8407170—).

From 2. NAL symposium on aircraft computational aerodynamics; Tokyo, Japan (5 Jul 1984).

Ames Research Center has the lead role among NASA centers to conduct research in computational fluid dynamics. The past, the present, and the future prospects in this field are reviewed. Past accomplishments include pioneering computer simulations of fluid dynamics problems that have made computers valuable in complementing wind tunnels for aerodynamic research. The present facilities include the most powerful computers built in the United States. Three examples of viscous flow simulations are presented: an afterbody with an exhaust plume, a blunt fin mounted on a flat plate, and the space shuttle. The future prospects include implementation of the Numerical Aerodynamic Simulation Processing System that will provide the capability for solving the viscous flow field around an aircraft in a matter of minutes.

4205 Materials Testing

REFER ALSO TO CITATION(S) 30098, 30104, 31285

30382 **(CEA-CONF—8157) Use of a medical scanner for non-destructive control of composite materials.** Thiery, C. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). Sep 1985. 6p. (In French). (CONF-8509241—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751350.

From 1. European conference on composite materials (ECCMI-1); Bordeaux, France (25 Sep 1985).

A presentation of purposes of researches and results about fitting and using of a medical scanner for non-destructive control of composite materials. This paper presents mainly how porosity and density may be evaluated and what are the real possibilities of the method about detection and calibration of used defects.

30383 **(EGG-M—05585) Diffraction moire of dynamic events.** Deason, V.A.; Epstein, J.E.; Reuter, W.G. (Idaho National Engineering Lab., Idaho Falls (USA)). 1985. Contract AC07-76ID01570. 10p. (CONF-851203—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007635.

From International conference and exhibition on fatigue, corrosion cracking, fracture mechanic and failure analysis; Salt Lake City, UT, USA (2 Dec 1985).

A system using diffraction moire to study dynamic loading events in opaque specimens is described. 150 1/mm diffraction gratings were replicated onto pre-notched steel bars and illuminated by a pulsed ruby laser during impulse loading. Details of the technique and equipment as well as typical data are presented. A similar experiment with a graphite/epoxy specimen and 1200 1/mm grating is briefly discussed.

30384 **(EGG-M—27784) Ultrasonic inspection of partially completed welds using pattern recognition techniques.** Carlson, N.M.; Johnson, J.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1986. Contract AC07-76ID01570. 8p. (CONF-860639—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86003227.

From Quantitative NDE; Williamsburg, VA, USA (24 Jun 1986).

The feasibility of using automated ultrasonic examination with computer-based pattern-recognition techniques to inspect partially completed welds on a pass-by-pass basis is investigated. In these tests welds are inspected, as they are being made, by an automated ultrasonic search unit attached to the weld head. Flaws are intentionally made in the weld. An analysis of the ultrasonic data collected during this process shows that the flaws can be reliably distinguished from good weld and, further, that two different types of flaws can be differentiated from each other. From this analysis a practical concurrent inspection system is shown to be feasible.

30385 **(K/PS—5068-EX) Thermal analysis of UF_6 cylinder inside a protective overpack.** Park, S.H. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 1986. Contract AC05-84OT21400. 8p. (CONF-860603—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86006815.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

To ensure safety, UF_6 cylinders containing reactor grade UF_6 are transported in a protective overpack. The overpack is designed to protect the UF_6 cylinder in a fire at least 1/2 hour in case of an accident. A thermal analysis was performed on a 76.2 cm diameter cylinder in a protective overpack to simulate various accident cases and to compare with available experimental data. The analysis included the thermal performance of both a damaged and undamaged overpack as well as the effect of moisture in the overpack. The result indicates that an average cylinder surface temperature inside an overpack, after exposing to a fire for 1 hour, is still below the level where appreciable UF_6 phase change would occur that could cause a cylinder to rupture.

30386 **(SAND—86-0079C) Analysis of triaxial testing using a fracture damage model.** Costin, L.S.; Stone, C.M. (Sandia National Labs., Albuquerque, NM (USA)). 18 Mar 1986. Contract AC04-76DP00789. 20p. (CONF-860682—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009090.

From SEM spring conference on experimental mechanics; New Orleans, LA, USA (8 Jun 1986).

Triaxial test configurations typical of those commonly used for rock were analyzed using a new damage model implemented in a finite element program. The model incorporates the effects of damage on material behavior due to the nucleation, growth and coalescence of microcracks during compressive loading. The calculations show that end effects, due to the constraint of the endcaps, heavily influences the deformation as the maximum load is approached. In the post-failure, softening regime, the calculations predict a localization of microcracking into larger fractures which result in axial splitting or slabbing in uniaxial tests or shear fault formation in triaxial tests. The analysis is shown to be in agreement with experimental results. 15 refs.

30387 **(SAND—86-0088C) Research directions in solid dynamics.** Herrmann, W. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 14p. (CONF-860616—9). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86005626.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

Some current research in solid dynamics at the Sandia National Laboratories will be outlined. The research is driven by technological needs in energy extraction, material processing, inertial confinement fusion, nuclear fission reactor safety, accident safety, and military applications, and involves problems of impact, explosion, and pulsed radiation. Emphasis is on the development of predictive solution methods for engineering design and performance assessment. Since most practical problems in solid dynamics involve material and geometric nonlinearities, numerical solutions are necessary. After a brief description of the computing environment, current directions in the development of algorithms and software for finite element and finite difference methods will be outlined. A central problem is the description of dynamic material behavior in constitutive equations. Recent work in several areas will be summarized: very high pressure equations of state and material strength, materials undergoing damage, mixtures, and reactive materials. A number of results of engineering calculations will be shown to illustrate capabilities, and some areas of future research will be outlined. 50 refs.

30388 **(SAND—86-1024C) Microscopic image analysis of slow crack growth in vitreous materials.** Smith, W.L. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1986. Contract AC04-76DP00789. 7p. (CONF-860418—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009850.

From 88. annual meeting of the American Ceramic Society; Chicago, IL, USA (27 Apr 1986).

Automated computer control, advanced video techniques, and digital image processing have been integrated into a servo-hydraulic testing system to produce a state-of-the-art testing environment. This system, in combination with an ultra high vacuum controlled environmental chamber, is used to produce high accuracy, subcritical slow crack growth data in vitreous materials. This video presentation is a review of the technologies used to extract data from the double cleavage drilled compression (DCDC) sample geometry.

30389 **(SAND—86-8219) SNLL materials testing compression facility.** Kawahara, W.A.; Brandon, S.L.; Korellis, J.S. (Sandia National Labs., Livermore, CA (USA)). Apr 1986. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009984.

This report explains software enhancements and fixture modifications which expand the capabilities of a servo-hydraulic test system to include static computer-controlled "constant true strain rate" compression testing on cylindrical specimens. True strains in excess of -1.0 are accessible. Special software features include schemes to correct for system compliance and the ability to perform strain-rate changes; all software for test control and data acquisition/reduction is documented.

4206 Safety Engineering

REFER ALSO TO CITATION(S) 29243

30390 **(GRS—59) Evaluation of criteria for the application of systems-analytical methods for safety analyses of chemical plants.** Hauptmanns, U.; Hoemke, P.; Huber, J.; Reichart, G.; Riotte, H.G. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). Dec 1985. 212p. (In German). NTIS (US Sales Only), PC A10/MF A01. File Number DE86751724.

A proposal for classifying chemical plants according to their hazard potential is made with the object of finding those branches of production in which it makes sense to use quantitative methods habitually used for investigating chemical plant safety are presented and their application is explained taking examples from the literature. The methods may serve for preparing a fault tree analysis, whose procedure as well as that for collecting realibility data is explained. A strategy for obtaining reliability data for the analysis of chemical plants is proposed and a preliminary reference data set based on evaluations in the field of energy production and values from the literature on chemical plants is given. The quantification of human failure in handling chemical plants is discussed. The practical application of fault tree analysis is demonstrated analyzing the process steps nitration and boiling of a plant for the production of the explosive hexogen. (orig./HP).

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 29506, 29507, 29508, 29509, 29510, 30150, 30435, 30436

30391 **(BDX—613-3477) Microprocessor controller for mold heating and cooling. Final report.** Floersch, R.H. (Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.). Apr 1986. Contract AC04-76DP00613. 22p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010298.

Microprocessor controllers were designed and implemented to perform direct digital control of the fluid and metal temperature-control loops used to temperature-cycle injection and compression molds. Microprocessor controllers replace a centralized computer system.

30392 **(BNL—37844) Comparison of the domain and frequency domain state feedbacks.** Zhang, S.Y. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 3p. (CONF-860638—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009429.

From American control conference; Seattle, WA, USA (18 Jun 1986).

In this paper, we present explicitly the equivalence of the time domain and frequency domain state feedbacks, as well as the dynamic state feedback and a modified frequency domain state feedback, from the closed-loop transfer function point of view. The difference of the two approaches is also shown.

30393 **(CONF-860693—1) Light emission from metal-insulator-metal structures biased near breakdown voltages.** Bloemer, M.J.; Goudonnet, J.P.; James, D.R.; Warmack, R.J.; Ferrell, T.L.; Arakawa, E.T.; Callcott, T.A. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008505.

From International symposium on electrical insulation; Washington, DC, USA (8 Jun 1986).

Optical emission is observed at prebreakdown voltages in thin film metal-insulator-metal (MIM) structures. Subsequent examination of the junction in a scanning electron microscope (SEM) reveals filamentary growth through the insulator. These tunnel junctions consist of Al-Al_2O_3-Ag or Al-Al_2O_3-Au with a variety of microstructures incorporated in the junction. The emission spectrum is found to be dependent on the geometry of the MIM structure. Comparison of theory and experiment suggests the emission results from the radiative decay of collective electronic excitations (surface plasmons) initiated by electrons tunneling through the insulator.

30394 **(DOE/CE/15192—T1) 400 Hz welding transformer gun assembly evaluation. Final report.** Kasten, D.G.; Penix, W. (Ohio State Univ., Columbus (USA). Dept. of Welding Engineering). 13 Mar 1986. Contract FG01-84CE15192. 51p. NTIS, PC A04. File Number DE86009973.

The purpose of this project is the evaluation of the transformer in question under higher frequency operation (approximately 400 Hz). This evaluation is facilitated by the monitoring of the instantaneous transformer voltages and currents. In addition winding temperature can be monitored using the cooling water as discussed in the report on SHORT CIRCUIT/DUTY CYCLE TESTS.

30395 **(DOE/CE/15192—T2) 400 Hz welding transformer gun assembly evaluation. Final report.** Kasten, D.G.; Penix, W. (Ohio State Univ., Columbus (USA). Dept. of Welding Engineering). Apr 1986. Contract FG01-84CE15192. 71p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86010211.

This project deals with the experimental evaluation of resistance welding transformer and gun assemblies used for high frequency (400 Hz) operation.

30396 (ESA-SP—30, pp vp) **Spacecraft orbital power evaluation (SCOPE).** Duncumb, W.R.; Casperd, A.N. May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

A FORTRAN program for analyzing the energy balance in a satellite power system during transfer orbit and other mission phases is presented. Piecewise integration is employed for computation of average battery current as the spacecraft spins, instead of calculus, to give full visibility of modeling techniques and provide data for plotting composite current and voltage waveforms. The program models a general power subsystems circuit which it solves for current, voltage and battery depth of discharge at increments of spacecraft attitude and time. Flexibility, limitations and interpretation of results of the simulation method are discussed. Ways of defining battery capacity are explained to clarify the battery model.

30397 (ESA-SP—30, pp vp) **MATPWR: a mission analysis tool for LEO spacecraft power profiles computation.** Fieux, B.; Lample, G.; Noel, P. May 1985. NTIS, PC A15/MF A01. (CONF-850656—).

From 16. IEEE annual PESC conference; Toulouse, France (24 Jun 1985).

A software tool to compute the power profiles for LEO spacecraft is presented. As outputs, the program delivers the power consumed (interfaced with power subsystem simulations) and analysis results: a report file, containing summarized results and statistics, and an output file compatible with an EARTHMAP visualization package. The tool was used for the ERS4 satellite. It can also be used for data relay satellites by replacing the power of the units by the data rate to transmit they require.

30398 **Microparticles and their effects in vacuum diodes.** Gray, E.W. (Sandia National Laboratories, Albuquerque, New Mexico, 87185). *Journal of Applied Physics;* **59**: No. 11, 3709-3715(1 Jun 1986). Contract AC04-76DP00789.

There has been considerable interest over the last few years in high-voltage vacuum devices for pulsed power applications in inertial confinement fusion and weapons related areas. This paper describes both the microparticles created in vacuum diodes and the impact craters that are formed when these microparticles collide at high and hypervelocities with the diode components. Particles formed from molten electrodes can have field enhancement factors greatly above that for a spherical particle on the electrode surface. This enhancement of the local electric field on the particles can lead to the high velocities encountered. Velocities of the particles are calculated to be in the range 10^4-10^6 m/s, and these compare favorably with those found in the literature. The presence of microparticles in high-voltage diodes can lead to lower breakdown voltages and premature degradation of insulator and other diode components.

30399 **Low-pass filters for signal averaging.** Voigtman, E.; Winefordner, J.D. (Chemistry Department, University of Florida, Gainesville, Florida 32611). *Review of Scientific Instruments;* **57**: No. 5, 957-966(May 1986). Contract AS05-78EV06022.

Detailed comparison of the settling time-noise bandwidth products of 31 types of low-pass filters demonstrates that the settling time-noise bandwidth product is the figure of merit for such filters when the goal is averaging. Common filters such as Butterworth, elliptic, and Chebyshev are found to be unusable for such purposes while others, such as Bessel filters, offer only moderate figures of merit. The best reported analog low-pass filter differs from ideality by only about 11%. The optimum analog low-pass filter, having continuous, rational transfer function, is unknown.

30400 **Counterpulse railgun energy recovery circuit.** Honig, E.M. (to Dept. of Energy, Washington, DC). US Patent 4,572,964. 25 Feb 1986. Filed date 28 Sep 1984. vp.

This patent describes a counterpulse railgun energy recovery circuit for propelling a projectile along a railgun the counterpulse railgun energy recovery circuit consists of: a railgun having an effective inductance; a source inductor initially charged to an initial current; current means for initially charging the source inductor to the initial current; first current-zero type switching means; second current-zero type switching; third current-zero type switching; muzzle current-zero type switching means; transfer capacitor, the transfer capacitor is for cooperating with the first, second, third, and muzzle current-zero type switching means for providing a resonant circuit for transferring current from the source inductor to the effective inductance of the railgun during the propelling of a projectile along the railgun and for returning current from the effective inductance of the railgun to the source inductance after the projectile has exited the railgun.

30401 **Noise isolation system for high-speed circuits.** McNeilly, D.R. (to Dept. of Energy). US Patent 4,563,660. 7 Jan 1986. Filed date 29 Dec 1983. vp.

This patent describes a high-frequency isolation system for high-speed circuits. It includes at least one power supply bus and a system ground bus. In addition, it consists of a high-speed circuit, a local ground bus, a first and second impedance element, and a first and second by-pass capacitor.

30402 **Magnetic fluorescent lamp having reduced ultraviolet self absorption.** Berman, S. M.; Richardson, R. W. (to The United States of America as represented by the Department of Energy). US Patent 4,549,110. 22 Oct 1985. Filed date 29 Dec 1983. vp.

PAT-APPL-566849.

The radiant emission of a mercury-argon discharge in a fluorescent lamp assembly is enhanced by providing means for establishing a magnetic field with lines of force along the path of electron flow through the bulb of the lamp assembly, to provide Zeeman splitting of the ultraviolet spectral line. Optimum results are obtained when the magnetic field strength causes a Zeeman splitting of approximately 1.7 times the thermal line width.

30403 **Monochromatic radio frequency accelerating cavity.** Giordano, S. (to The United States of America as represented by the United States Department of Energy). US Patent 4,540,960. 10 Sep 1985. Filed date 9 Feb 1984. vp.

PAT-APPL-578406.

A radio frequency resonant cavity having a fundamental resonant frequency and characterized by being free of spurious modes. A plurality of spaced electrically conductive bars are arranged in a generally cylindrical array within the cavity to define a chamber between the bars and an outer solid cylindrically shaped wall of the cavity. A first and second plurality of mode perturbing rods are mounted in two groups at determined random locations to extend radially and axially into the cavity thereby to perturb spurious modes and cause their fields to extend through passageways between the bars and into the chamber. At least one body of lossy material is disposed within the chamber to damp all spurious modes that do extend into the chamber thereby enabling the cavity to operate free of undesired spurious modes.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 30034, 30101, 30281, 30325, 30326

30404 **Magnetically focused liquid drop radiator.** Botts, T.E.; Powell, J.R.; Lenard, R. (to Dept. of Energy). US Patent 4,572,285. 25 Feb 1986. Filed date 10 Dec 1984. vp.

This patent describes a liquid droplet radiator having a droplet generator for producing directed streams of droplets, a collector spaced from the generator to collect the streams of droplets directed toward it from the generator, and fluid handling means for withdrawing fluid from the collector and delivering it to the generator under pressure. The improvement described here consists of a magnetizable liquid or slurry in the generator and in the means for withdrawing and delivering liquid, and magnetic means disposed in operative relationship to the collector for producing a magnetic flux field that extends into areas located transversely outward from the straight-line droplet stream "MISS" path beyond the collector. This is effective to focus and accelerate the streams of droplets, thereby to direct them from the areas into the collector.

4220 Underground Engineering

30405 **Method for isolating two aquifers in a single borehole.** Burklund, P. W. (to The United States of America as represented by the United States Department of Energy). US Patent 4,548,266. 22 Oct 1985. Filed date 20 Jan 1984. vp.

PAT-APPL-572346.

A method for isolating and individually instrumenting separate aquifers within a single borehole. A borehole is first drilled from the ground surface, through an upper aquifer, and into a separating confining bed. A casing, having upper and lower sections separated by a coupling collar, is lowered into the borehole. The borehole is grouted in the vicinity of the lower section of the casing. A borehole is then drilled through the grout plug and into a lower aquifer. After the lower aquifer is instrumented, the borehole is grouted back into the lower portion of the casing. Then the upper section of the casing is unscrewed via the coupling collar and removed from the borehole. Finally, instrumentation is added to the upper aquifer and the borehole is appropriately grouted. The coupling collar is designed to have upper right-hand screw threads and lower left-hand screw thread, whereby the sections of the casing can be readily separated.

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 29281, 29699, 29700, 29705, 29707, 29708, 29711, 29713, 29716, 29721, 29725, 29727, 29728, 29735, 29742, 29743, 29744, 29745, 30529, 30531

30406 (EPRI-CS—4404-Vol.4, pp 27.1-27.7) **Air pollution control: maintenance cost savings from the washing, patching and reuse of bags used in fabric filters.** Cross, F.L. Jr. (Cross/Tessitore and Associates, Orlando, FL). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

One of the highest costs in operating a fabric filter is bag replacement. Reduced bag life is the result of poor design, improper bag selection and poor operation and maintenance. This paper discusses how the replacement costs of bags can be reduced by the use of a field-operated spindle-type washing device. Techniques are described for washing and patching bags, the cost and type of equipment used in the maintenance program, the labor involved, and the cost savings and improved performance that can be obtained. These details are based upon a phosphate rock bulk-handling facility located at Tampa, Florida, with over ten baghouses ranging from 10,000 to 70,000 cubic feet per minute in capacity. 4 figures, 2 tables.

4250 Power Cycles

30407 (UCRL—94019) **Operating efficiencies of a Lysholm helical expander for Brayton-cycle heat engines.** Myers, B.; Deis, G.; Shell, T. (Lawrence Livermore National Lab., CA (USA)). Jan 1986. Contract W-7405-ENG-48. 10p. (CONF-860635—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE86007178.

From 31. international gas turbine conference and exhibit; Dusseldorf, F.R. Germany (8 Jun 1986).

Operating tests on a Lysholm helical expander have been done to develop a data base for comparing the performance of helical expanders with turbine expanders by using simple scaling arguments. The eventual goal of such work would be to develop a rugged and reliable ceramic helical expander for operating at temperatures up to 1300°C (2400°F). We used a 127.5 mm (5.020 in.) metal expander on which we measured seven performance variables against applied pressure ratio at six shaft speeds and an inlet gas temperature of 100°C (212°F). Our data system included: a torque and angular-speed cell to measure power; flow, pressure, and temperature instrumentation; and a data reduction program. Test results are presented in seven data plots; equations for computing the performance variables are tabulated. Adiabatic efficiency was found to be at least 85% in the pressure ratio range of 2.75 to 5.00. Performance is strongly influenced by gas leakage. Large machines with clearance ratios the same as smaller machines would benefit by size scaling effects. We expect that ceramic helical expanders for 1300°C service would be able to operate at adiabatic efficiencies higher than 85%. 9 refs., 12 figs., 1 tab.

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

30408 (IPNO-GEPL—83-13) **Radial injection in the Orsay cryogenic cyclotron project.** Bretonneau, P.; Cabrespine, A.; Coster, J.M. de; Junquera, T.; Kang, Z.H.; Roussel, P.; Waast, B. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1983. 48p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751320.

The different problems encountered in matching the tandem emittance are examined. The found solutions or compromises are described for geometric, energetic and -mainly- time structure matching. It leads to definite choices for the terminal stripping, the phase buncher at the exit of the tandem and the proper injection system at the entrance of the cyclotron. Practical consequences are

finally given: the tandem cyclotron platform, the chopper and buncher systems, the modifications in the tandem itself, the beam transport and the cyclotron injection systems.

30409 **(LBL—20979) Comparison of the design and costs of induction linac drivers for inertial fusion using ions of differing mass.** Hovingh, J.; Brady, V.O.; Faltens, A.; Lee, E.P. (Lawrence Livermore National Lab., CA (USA); Lawrence Berkeley Lab., CA (USA)). Jan 1986. Contract W-7405-ENG-48. 8p. (CONF-860610—23). NTIS, PC A02/MF A01; GPO Dep. File Number DE86007484.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

An induction linear accelerator that produces an energetic (5 to 20 GeV) beam of heavy (130 to 238 amu) ions is a prime candidate as a driver for inertial fusion. The required accelerator output parameters for an ion species can be determined from the target requirements for a given fusion energy yield. The cost and efficiency of various accelerator configurations to produce the required output parameters can be determined to aid in the selection of the lowest cost accelerator design option. In this study, we compare the cost of various accelerator configurations that will produce various target fields and fusion powers using cesium 133 ions with those using mercury 200 ions, and report extensively on some 600 MJ target yield results.

30410 **(LBL—21255) Low energy cyclotron for radiocarbon dating.** Welch, J.J. (Lawrence Berkeley Lab., CA (USA)). Dec 1984. Contract AC03-76SF00098. 74p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009949.

The measurement of naturally occurring radioisotopes whose half lives are less than a few hundred million years but more than a few years provides information about the temporal behavior of geologic and climatic processes, the temporal history of meteoritic bodies as well as the production mechanisms of these radioisotopes. A new extremely sensitive technique for measuring these radioisotopes at tandem Van de Graaff and cyclotron facilities has been very successful though the high cost and limited availability have been discouraging. We have built and tested a low energy cyclotron for radiocarbon dating similar in size to a conventional mass spectrometer. These tests clearly show that with the addition of a conventional ion source, the low energy cyclotron can perform the extremely high sensitivity ^{14}C measurements that are now done at accelerator facilities. We found that no significant background is present when the cyclotron is tuned to accelerate ^{14}C negative ions and the transmission efficiency is adequate to perform radiocarbon dating on milligram samples of carbon. The internal ion source used did not produce sufficient current to detect ^{14}C directly at modern concentrations. We show how a conventional carbon negative ion source, located outside the cyclotron magnet, would produce sufficient beam and provide for quick sampling to make radiocarbon dating milligram samples with a modest laboratory instrument feasible.

30411 **(ORNL/M—157) Future directions in intermediate energy heavy ion physics. A proposed expansion of the Holifield Facility.** (Oak Ridge National Lab., TN (USA)). Feb 1986. Contract AC05-84OR21400. 423p. NTIS, PC A18/MF A01; 1; GPO Dep. File Number DE86010007.

A proposal is presented for a major accelerator addition to the Holifield Heavy Ion Research Facility. The expanded facility will provide ion beams of mass 1 to 238 amu with a combination of energy, intensity, momentum resolution, and beam quality not currently available at any other facility in North America. The physics motivation for such an addition is discussed, and involves physics dominated by meson-exchange forces, Coulomb-force dominated physics, and possibly a regime where the quark and gluon degrees of freedom are significant. The physics research would include topics in atomic and interdisciplinary areas as well as nuclear physics. Some remarks are made on the merits of Oak Ridge as a site for this facility, placing the proposal in some historical perspective. The accelerator system is then described, giving the required beam properties, and the parameters of the synchrotron ring components, injection, ring magnets, RF systems, vacuum system, and electron cooling system and stochastic cooling system requirements. Also described are such facilities as buildings, beam transport and shielding, and experimental facilities, including target areas. (LEW)

4302 Beam Dynamics, Field Calculations, And Ion Optics

30412 **(FNAL/C—86/30) Introduction to the nonlinear dynamics arising from magnetic multipoles.** Michelotti, L. (Fermi National Accelerator Lab., Batavia, IL (USA)). Mar 1986. Contract AC02-76CH03000. 27p. (CONF-840873—5). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009872.

From US summer school on high energy particle accelerators; Batavia, IL, USA (13 Aug 1984).

A Hamiltonian is derived describing transverse particle motion in a storage ring. After a transformation to "action-angle" variables we show how to apply Green's function techniques to do Lie transform perturbation theory on this Hamiltonian. Two examples are worked out to second order: (1) normal and skew quadrupole field errors; and (2) normal sextupoles. A brief discussion of the single resonance term Hamiltonian includes derivations of the two invariants and calculation of the resonance width for one degree of freedom systems. Finally, we generalize Courant's treatment of modulational diffusion as an illustrative application of Chirikov's criterion to a multi-resonance problem. 29 refs., 3 figs.

30413 **(LA-UR—86-1368) RFQ scaling-law implications and examples.** Wadlinger, E.A. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 4p. (CONF-860629—1). NTIS, PC A02. File Number DE86010193.

From Linear accelerator conference; Stanford, CA, USA (2 Jun 1986).

We demonstrate the utility of the RFQ scaling laws that have been previously derived. These laws are relations between accelerator parameters (electric field, fr frequency, etc.) and beam parameters (current, energy, emittance, etc.) that act as guides for designing radio-frequency quadrupoles (RFQs) by showing the various tradeoffs involved in making RFQ designs. These scaling laws give a unique family of curves, at any given synchronous particle phase, that relates the beam current, emittance, particle mass, and space-charge tune depression with the RFQ frequency and maximum vane-tip electric field when assuming equipartitioning and equal longitudinal and transverse tune depressions. These scaling curves are valid at any point in any given RFQ where there is a bunched and equipartitioned beam. We show several examples for designing RFQs, examine the performance characteristics of an existing device, and study various RFQ performance limitations required by the scaling laws.

30414 **(SLAC-CN—326) Centrifugal space-charge forces in SLC.** Sands, M. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). 14 Apr 1986. Contract AC03-76SF00515. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010092.

A preliminary estimate is made of the effect of the centrifugal space charge forces on SLC assuming that the space-charge effect is a highly nonlinear force whose important term is the second derivative at the beam center. A scaling law is used to get the horizontal chromaticity for the arcs of SLC, and the space-charge effect on the beam is calculated on that basis. (LEW)

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 30099, 30361, 30363, 30462, 30463, 30464, 30470, 30490, 31218, 31220

30415 **(BNL—37817) Microwave undulator.** Batchelor, K. (Brookhaven National Lab., Upton, NY (USA)). Mar 1986. Contract AC02-76CH00016. 22p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009910.

The theory of a microwave undulator utilizing a plane rectangular waveguide operating in the TE/sub 10n/ mode and other higher order modes is presented. Based on this, a possible undulator configuration is analyzed, leading to the conclusion that the microwave undulator represents a viable option for undulator wavelength down to about 1 cm where peak voltage and available

microwave power considerations limit effectiveness. 4 refs., 4 figs. (LEW)

30416 (TRI-PP—86-2) Status of the optically pumped polarized H^- ion source at TRIUMF. Levy, C.D.P.; McDonald, M.; Schmor, P.W.; Uegaki, J. (TRIUMF, Vancouver, British Columbia (Canada)). Jan 1986. 4p. (CONF-860126—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE86901244.

From International workshop on polarized sources and targets; Montana, Switzerland (13 Jan 1986).

An optically pumped polarized H^- ion source, producing $\geq$5 μA of H^- current with $\geq$50% polarization, has been developed at TRIUMF. The polarization transfer efficiency between sodium atoms and 5 keV deuterons was measured to be 0.62 +- 0.09 at a magnetic field strength of 12.6 kG.

30417 (TRI-PP—86-3) TRIUMF polarized deuteron target NMR system. Wait, G.D.; Cresswell, J.V.; Delheij, P.P.J.; Hayden, M.; Healey, D.C.; Waters, G. (TRIUMF, Vancouver, British Columbia (Canada)). Jan 1986. 4p. (CONF-860126—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE86901243.

From International workshop on polarized sources and targets; Montana, Switzerland (13 Jan 1986).

An NMR System has been built for a small volume polarized deuterium target that has been recently commissioned at TRIUMF. The target material consists of 1.3 cc of deuterated butanol beads which are contained in the coil of a tuned circuit and is cooled to 100 mK in a ^{3}He/^{4}He dilution refrigerator. A frequency synthesizer under the control of an 8085 based microprocessor (TRIMAC) provides the RF frequency sweep. A Starburst (J-11) and an LSI-11 are used to process the NMR signal. The RF phase angle is measured and is used to generate a correction voltage which is fed back to keep the tuned circuit at resonance and permit the measurement of the real part of the NMR signal. The signal normalization factor (TE signal area x temperature) is measured with an accuracy of 8%. The best polarization achieved so far was -.37 under target laboratory test conditions. Polarizations of -.33 were routinely achieved during a three week run in the TRIUMF M11 pion beam.

30418 (TRI-PP—86-5) Review of optically pumped polarized ion sources. Schmor, P.W. (TRIUMF, Vancouver, British Columbia (Canada)). Jan 1986. 5p. (CONF-860126—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE86901242.

From International workshop on polarized sources and targets; Montana, Switzerland (13 Jan 1986).

The status of optically pumped polarized H^- ion sources is reviewed. Three sources are currently being tested and a fourth is funded. Recent results from the three operating sources are summarized. The INR source in Moscow has already achieved 60 μA of H^-. Aspects requiring further research and development, before the source is capable of producing 1 mA, are outlined.

30419 Method for production of ceramic oxide and carbide bodies by polymer inclusion and decomposition. Quinby, T. C. (to The United States of America as represented by the United States Department of Energy). US Patent 4,537,818. 27 Aug 1985. Filed date 30 Aug 1984. vp.

PAT-APPL-645653.

A method for the preparation of thin, free-standing metal oxide films which are useful as nuclear accelerator target materials. Cations of any metal except those of Group IA and precious metals, such as, U, Zr, Nd, Ce, Th, pr or Cr, are absorbed on a thin film of polymeric material, such as, carboxymethylcellulose, viscose rayon or cellophane. The cation impregnated polymeric material is dried. Then the impregnated film is heated in an inert atmosphere to form a carbonized membrane. The carbonized membrane is oxidized to yield a thin, self-supporting, metal oxide membrane. Or, the membrane can be heated in an inert atmosphere to yield a thin, self-supporting, metal carbide-containing membrane.

4304 Storage Rings

REFER ALSO TO CITATION(S) 30414, 30463

30420 (LAL-RT—85-08) Spin-transparent vertical beam kicker. Buon, J. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Jul 1985. 5p. (CONF-8506173—8). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751353.

From Workshop on polarized beams at the SSC; Ann Arbor, MI, USA (10 Jun 1985).

A spin-transparent beam kicker is proposed for allowing a terrain following design of a very large ring without destroying beam polarization. 2 refs.

30421 (LAL-RT—85-09) Depolarization effects in a ring equipped with snakes. Buon, J. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Jul 1985. 7p. (CONF-8506173—9). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751354.

From Workshop on polarized beams at the SSC; Ann Arbor, MI, USA (10 Jun 1985).

Depolarization effects in a two-snake proton ring are studied qualitatively and numerically. They have been found to occur when crossing an isolated intrinsic resonance with a strength larger than .18-.25 about, even without any shift of the spin tune away from the ideal 1/2 value. No such effect is observed when crossing imperfection resonances. 6 refs.

44 INSTRUMENTATION

30422 (BNL—37948) X-ray position detection in the region of 6 μm RMS with wire proportional chambers. Fischer, J.; Radeka, V.; Smith, G.C. (Brookhaven National Lab., Upton, NY (USA)). Apr 1986. Contract AC02-76CH00016. 24p. (CONF-860272—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009940.

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

We have developed a MWPC system for x-ray detection with a position resolution in the region of 6 μm RMS (14 μm FWHM). The performance with argon, krypton or xenon at pressures from 1 to 10 atm is explored for the x-ray energy range 5 to 25 keV. At a resolution of 6 μm RMS the effects of photoelectron and Auger electron range, electronic noise, avalanche spread, lateral electron diffusion, as well as x-ray beam collimation, become of comparable magnitude. Their limiting effects on avalanche centroid fluctuation, and hence on position resolution, are investigated. The position resolution achieved in this work compares favorably with that of solid state devices. 7 refs., 6 figs.

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 30665, 30666, 30835, 30976

30423 (BNL—37899) Silicon position sensitive detectors for the HELIOS (NA34) experiment. Beuttenmuller, R.; Bisi, V.; Chesi, E.; Di Nardo, R.P.; Esten, M.J.; Giubellino, P.; Kraner, H.W.; Ludlam, T.W.; Meddi, F.; Piuz, F. (Brookhaven National Lab., Upton, NY (USA); European Organization for Nuclear Research, Geneva (Switzerland); University Coll., London (UK); Vrije Univ., Brussels (Belgium); Rome Univ. (Italy); Turin Univ. (Italy)). Mar 1986. Contract AC02-76CH00016. 34p. (CONF-8603109—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009428.

From 4. European symposium on semiconductor detectors; Munich, F.R. Germany (3 Mar 1986).

Silicon detectors having both "pad" and strip position sensitive configurations have been fabricated for the HELIOS experiment which requires an elaborate pulse height-dependent trigger as well as one dimensional silicon strip position sensing. The trigger detector is a 400 element, 30 mm diameter detector with readout connections from a ceramic overlay board. Tests with full proto-

type detectors have shown essentially 100% detection efficiency and excellent pulse height resolution well capable of delineating 0, 1 or 2 hits per pad. Strip detectors with 25 μm pitch and a varying readout pitch have been tested, which utilize both capacitive and resistive charge division. Techniques for realization of required interstrip resistors will be discussed and results which may compare these readout methods will be reported. 11 refs., 13 figs.

30424 **(CEA-CONF—7958) Reactor antineutrino background at Gran Sasso.** Lagage, P.O. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Apr 1985. 10p. (CONF-8504156—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751597.

From 1. symposium on underground physics; St. Vincent, Italy (25 Apr 1985).

Details are given is this paper on background for the detectors of low energy (< 10 MeV) electronic anti-neutrinos. Background whose important sources is the nuclear power-stations.

30425 **(LBL—20664) Detection of charged particles in amorphous silicon layers.** Perez-Mendez, V.; Morel, J.; Kaplan, S.N.; Street, R.A. (Lawrence Berkeley Lab., CA (USA); Xerox Palo Alto Research Center, CA (USA)). Feb 1986. Contract AC03-76SF00098. 17p. (CONF-860272—7; CONF-8603109—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009362.

From Wire chamber conference; Vienna, Austria (25 Feb 1986).

The successful development of radiation detectors made from amorphous silicon could offer the possibility for relatively easy construction of large area position-sensitive detectors. We have conducted a series of measurements with prototype detectors, on signals derived from alpha particles. The measurement results are compared with simple model calculations, and projections are made of potential applications in high-energy and nuclear physics.

30426 **(N—86-16552) Earth Radiation Budget Experiment (ERBE) scanner instrument anomaly investigation.** Watson, N.D.; Miller, J.B.; Taylor, L.V.; Lovell, J.B.; Cox, J.W.; Fedors, J.C.; Kopia, L.P.; Holloway, R.M.; Bradley, O.H. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Oct 1985. 87p. (NASA-TM—87636). NTIS, PC A05/MF A01.

The results of an ad-hoc committee investigation of in-Earth orbit operational anomalies noted on two identical Earth Radiation Budget Experiment (ERBE) Scanner instruments on two different spacecraft busses is presented. The anomalies are attributed to the bearings and the lubrication scheme for the bearings. A detailed discussion of the pertinent instrument operations, the approach of the investigation team and the current status of the instruments now in Earth orbit is included. The team considered operational changes for these instruments, rework possibilities for the one instrument which is waiting to be launched, and preferable lubrication considerations for specific space operational requirements similar to those for the ERBE scanner bearings.

30427 **Picosecond photoconductors as radiation detectors.** Wagner, R.S.; Bradley, J.M.; Hammond, R.B. (Electronics Div., Los Alamos National Lab., Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The authors have developed a new class of extremely high-speed radiation detectors. They are simple and inexpensive to fabricate, rugged, and reliable. They have demonstrated their sensitivity to gamma-rays, x-rays, soft x-rays, charged particles, and light and have obtained response speeds of <100 ps. Their current response is proportional to incident-radiation intensity. The detectors are not used for detecting single particles or measuring particle energy. Their current response is due to the modulation of the conductance of the semiconductor crystal by transient-radiation events. The devices are fabricated from bulk-semiconductor crystals and achieve picosecond response by fast carrier relaxation in the crystals. Fast carrier relaxation is obtained by intentionally introducing trapping and recombination centers into the semiconductor crystal by impurity doping or radiation damage. Here the authors discuss the design, fabrication, and characterization of InP:Fe, GaAs, and neutron-damaged InP:Fe and GaAs photoconductive radiation detectors. They also present a model for transient response in InP:Fe photoconductors.

30428 **Detection of charged particles in amorphous silicon layers.** Kaplan, S.N.; Morel, J.R.; Mulera, T.A.; Perez-Mendez, V.; Schnurmacher, G.; Street, R.A. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The successful development of radiation detectors made from amorphous silicon could offer the possibility for relatively easy construction of large area position-sensitive detectors. The authors have conducted a series of measurements with prototype detectors, on signals derived from alpha particles. The measurement results are compared with simple model calculations, and projections are made of potential applications in high-energy and nuclear physics.

30429 **A reliable automatic liquid nitrogen filling system.** Landis, D.A.; Madden, N.W.; Goulding, F.S. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

An automatic liquid nitrogen filling system is described. Two of these units have been in use at an unattended location for 10 months without failure. The system automatically refills a 5 liter detector cryostat as required from a 50 liter supply Dewar. The liquid nitrogen filling system is comprised of three basic components: an analog level monitor, a low loss liquid transfer mechanism and a controller. These are described in the text.

30430 **300-element silicon-lithium position-sensitive imaging detector for angiography.** Walton, J.T.; Sommer, H.A.; Thompson, A.C.; Hughes, E.B.; Zeman, H.D. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Silicon lithium-drifted [Si(Li)] detectors 150 mm long, 10 mm wide and 5 mm thick with 300 individual elements have been fabricated as imaging detectors for noninvasive studies of human coronary arteries using 33 keV x-rays from a synchrotron radiation beamline. This detector is an extension of earlier work on 30 mm long devices with initially 30 and later 60 elements. The detector fabrication details are discussed highlighting problems in uniform lithium-ion compensation. The device structure is examined and measurements on the interelement impedances presented. Finally an angiograph of the coronary arteries in an excised pig's heart obtained with this 300-element detector is presented.

30431 **Stack monitor for the proof-of-breeding project.** Fergus, R.W. (Argonne National Lab., 9700 S. Cass Avenue, Argonne, IL 60439). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

This stack monitor system is a coordinated arrangement of hardware and software to monitor four hot cells (8 stacks) during the fuel dissection for the Proof-of-Breeding Project. The cell monitors, which are located in fan lofts, contain a microprocessor, radiation detectors, air flow sensors, and air flow control equipment. Design criteria included maximizing microprocessor control while minimizing the hardware complexity. The monitors have been pro-

grammed to produce concentration and total activity release data based on several detector measurements and flow rates. Although each monitor can function independently, a microcomputer can also be used to control each cell monitor including reprogramming if necessary. All programming is software, as opposed to firmware, with machine language for compactness in the cell monitors and Basic language for adaptability.

30432 **A transuranic-aerosol-measurement system for the workplace or stack monitoring.** Kaifer, R.C.; Kordas, J.F.; Phelps, P.L.; Prevo, C.T.; Bierman, A.H.; Rueppel, D.W.; Sawyer, D.L.; Del Vasto, M.; Merrill, T.J.; Salbeck, R.E. (Lawrence Livermore National Lab., P.O. Box 808 (L-381), Livermore, CA 94550). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

This compact transuranic-aerosol-measurement system, using alpha spectroscopy at vacuum, has a sensitivity of less than 0.5 MPC-hr for ^{239}Pu. In addition, a detector is mounted in the inlet pipe that responds immediately if there is a release of radioactivity; then, after an appropriate time, the filter is moved to the vacuum chamber for more sensitive off-line analysis. The system is very efficient for particles as large as 10 μm in diameter. A micro-computer controls the filter transport, operates as a 256-channel PHA, performs calculations, checks calibration, and drives a matrix display and a central computer. This instrument, called WOTAMS, has been developed for use in facilities that process transuranics with the expectation it will further evolve into a commercial product to replace those less sensitive instruments now widely used.

30433 **A solid state directional gamma detector.** Baird, W.; Unrah, W.P.; Bjarke, G.O.; Beauchamp, P.K. (Los Alamos National Lab., Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A solid-state gamma-ray detector has been developed which exhibits directionality. Four PIN diode detectors are backed with Pb and arranged in a square array which exhibits an angular response to gamma rays. The high-Z material provides directionality and also enhances the sensitivity of the detectors to high-energy gammas by means of the x-ray fluorescence accompanying photon interactions in the backing. The array responses are used to identify the quadrant containing the source and obtain the radiation level. Ratios of the counting rates in opposite pairs of detectors are used to determine the angular position of the source within the quadrant.

30434 **High range gamma radiation meter.** Baird, W.; Bjarke, D.; Eisen, Y. (Los Alamos National Lab.). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A low power meter has been constructed and tested to measure gamma fields from .1 R/h to 1500 R/h over the energy range of 60 keV to 1.2 MeV. The portable, battery-powered meter consists of a local display unit and remote probe. The display unit indicates gamma intensities via a 4-1/2 digit liquid crystal display (LCD) and a 50-segment bargraph LCD.

30435 **FASTBUS review 1985.** Walz, H.V.; Barsotti, E.J. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The progress of developments based on the FASTBUS specification DOE/ER-0189 for modular high-speed data acquisition and control systems is reviewed. Available hardware components and efforts in standardized FASTBUS software are summarized. The status of FASTBUS applications at research laboratories in North America is reported. FASTBUS work in Europe and Japan is presented in other papers at this conference. Due to the highly condensed nature of this review, background information and references from reports at the 1983 and 1984 Nuclear Science Symposia may be useful.

30436 **Introduction to semi-custom integrated circuits.** Dhawan, S.K. (Gibbs Lab., Yale Univ., New Haven, CT 06511). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC02-76ER03075.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Several manufacturers have in stock processed silicon wafers for analog and digital circuits which can be customized by one or more layers of metallization to interconnect devices to produce application specific I.C.'s (ASIC). The new CAE/CAD tools make it easy to design functional circuits and run full timing and performance simulation before committing to hardware. ASIC's are cost effective for just one particle physics detector.

30437 **A sophisticated gamma-ray data acquisition system based on an IBM PC/XT computer.** Moss, C.E. (Los Alamos National Lab., Mail Stop J562, Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

It is easy to assemble and program an automated gamma-ray data acquisition system consisting of an IBM PC/XT computer and several computer-controllable modules. This system features pattern recognition to determine the energy calibration, automatic gain setting, automatic efficiency calibration, detector-positioner control, and source-changer control in addition to the more conventional operations.

30438 **A low-cost general purpose spectral display unit using an IBM PC.** Robinson, S.L. (Lawrence Livermore National Lab., P.O. Box 808, Livermore, CA 94550). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract W-7405-ENG-48.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Many physics experiments require acquisition and analysis of spectral data. Commercial minicomputer-based multichannel analyzers collect detected counts at various energies, create a histogram of the counts in memory, and display the resultant spectra. They acquire data and provide the user-to-display interface. The system discussed separates functions into the three modular components of data acquisition, storage, and display. This decoupling of functions allows the experimenter to use any number of detectors for data collection before forwarding up to 64 spectra to the display unit, thereby increasing data throughput over that available with commercial systems. An IBM PC was chosen for the low-cost, general purpose display unit. Up to four spectra may be displayed simultaneously in different colors. The histogram saves 1024 channels per detector, 640 of which may be distinctly displayed per spectra. The IEEE-488 standard provides the data path between the IBM PC and the data collection unit. Data is sent to the PC under interrupt control, using direct memory access. Display manipulations available via keyboard are also discussed.

30439 **Examination of the role of detection systems in quantitation and image quality in PET.** Hoffman, E.J.; Dahlbom, M.; Ricci, R.; Weinberg, I.N. (Division of Nuclear Medicine and Biophysics, UCLA School of Medicine, and Laboratory of Nuclear Medicine, University of California, Los Angeles). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00012.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Future improvement in PET will likely be the result of the development of devices to circumvent limitations on resolution imposed by one crystal/photomultiplier (PMT) detector systems. Three types of systems are in some stage of development: (1) multiple crystals coupled to multiple PMTs in such a manner that simple digital logic codes identify crystals of interaction, (2) single or multiple crystals coupled to multiple PMTs in such a manner that analog logic systems identify crystals of interaction, and (3) small solid-state photosensors which either identify crystals of interaction with timing by the PMT or completely replace the PMT. The value of the various types of detectors must be considered in terms of the type of measurement that is to be performed. Factors that must be considered are the distribution of the radioisotope in the field-of-view, the amount of activity that may be injected because of dose considerations and the size of the structures to be imaged.

30440 **A new type of REM measuring instrument.** Brackenbush, L.W.; Endres, G.W.R.; Madlock, D.E. (Pacific Northwest Lab., P.O. Box 999, Richland, WA 99352). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC06-76RL01830.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Research at various laboratories has demonstrated that it is possible to measure the radiation dose from neutrons and gamma rays using a tissue equivalent proportional counter. This paper describes the dose equivalent algorithms and electronic circuitry used to develop an instrument designed to measure the total dose equivalent from mixed radiation fields. The pocket sized instrument utilizes a microprocessor and a cylindrical tissue equivalent proportional counter as the radiation detector.

30441 **The Collider Detector at Fermilab (CDF).** Jensen, H.B. (Fermi National Accelerator Lab., P.O. Box 500, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A description of the Collider Detector at Fermilab (CDF) is given. It is a calorimetric detector, which covers almost the complete solid angle around the interaction region with segmented calorimeter "towers". A 1.5 Tesla superconducting solenoid, 3m in diameter and 5m long, provides a uniform magnetic field in the central region for magnetic analysis of charged particles. The magnetic field volume is filled with a large cylindrical drift chamber and a set of Time Projection Chambers. Muon detection is accomplished with drift chambers outside the calorimeters in the central region and with large magnetized steel toroids and associated drift chambers in the forward-backward regions. The electronics has a large dynamic range to allow measurement of both high energy clusters and small energy depositions made by penetrating muons. Interesting events are identified by a trigger system which, together with the rest of the data acquisition system, is FASTBUS based.

30442 **Overview of the SLD.** Breidenbach, M. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The SLD is a second generation detector for the SLAC Linear Collider (SLC). It is optimized for Z^0 physics and exploration of new physics in the Z^0 energy region. The SLD will have a CCD vertex detector, high resolution drift chambers for momentum measurement, a Cerenkov Ring Imaging Detector for particle identification, and calorimetry based on lead/liquid argon followed by an iron/gas system. The detector covers the full solid angle.

30443 **Overview of the data acquisition electronics system design for the SLAC linear collider detector (SLD).** Larsen, R.S. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The SLD Detector will contain five major electronics subsystems: Vertex, Drift, Liquid Argon Calorimeter, Cerenkov Ring Imaging, and Warm Iron Calorimeter. To implement the approximately 170,000 channels of electronics, extensive miniaturization and heavy use of multiplexing techniques are required. Design criteria for each subsystem, overall system architecture, and the R & D program are described.

30444 **Waveform sampler CAMAC module.** Freytag, D.R.; Haller, G.M.; Wang, J. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A Waveform Sampler Module (WSM) for the measurement of signal shapes coming from the multi-hit drift chambers of the SLAC SLD detector is described. The module uses a high speed, high resolution analog storage device (AMU) developed in collaboration between SLAC and Stanford University. The AMU devices together with high speed TTL clocking circuitry are packaged in a hybrid which is also suitable for mounting on the detector. The module is in CAMAC format and provides eight signal channels, each recording signal amplitude versus time in 512 cells at a sampling rate of up to 360 MHz. Data are digitized by a 12-bit ADC with a 1 μs conversion time and stored in an on-board memory accessible through CAMAC.

30445 **dE/dx electronics for MARK II experiment at SLAC.** Bernstein, D.; Boyarski, A.; Coupal, D.; Feldman, G.; Paffrath, L. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

This paper describes a 100 MHz pulse digitizer for dE/dx measurements on the MARK II drift chamber at SLAC. The electronics provides the read-out of the detector's 5832 sense wires, organized in 336 wires/FASTBUS crate. The system is based on a 16-channel FASTBUS module. The basic element of the module is the TRW 6-bit Flash-ADC.

30446 **A silicon vertex detector for CDF.** Bedeschi, F.; Belforte, S.; Bellettini, G.; Bosisio, L.; Cervelli, F.; Chiarelli, G.; DelFabbro, R.; Dell'Orso, M.; DiVirgillo, A.; Focardi, E. (Istituto Nazionale di Fisica Nucleare Pisa). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The major reason for building a vertex detector for CDF is the tagging of decay vertices of particles with lifetime in the 10^{-13}/ 10^{-12} sec. range. This is a complementary approach to heavy flavour physics with respect to missing E/sub T/ and large p/sub T/ leptons. The method can be best applied to tag hadronic decays of heavy flavours, which have the largest branching ratios, but have eluded any specific tagging until now. It also works, although with somewhat reduced efficiency, in events with a semileptonic decay. All in all it promises to be a powerful tool in the search of rather elusive processes like Higgs, top, or fourth generation quark production. The additional information provided by the vertex detector will also improve significantly the resolution of the CDF cen-

tral tracking system. Arrays of microstrip silicon detectors were used.

30447 **The Rabbit system: Low cost, high reliability front end electronics featuring 16 bit dynamic range.** Drake, G.; Droege, T.F.; Nelson, C.A. Jr.; Turner, K.J.; Ohska, T.K. (Fermi National Accelerator Lab., Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A new crate-based front end system has been built which features low cost, compact packaging, command capability, 16 bit dynamic range digitization, and a high degree of redundancy. The crate can contain a variety of instrumentation modules, and is designed to be situated close to the detector. The system is suitable for readout of a large number of channels via parallel multiprocessor data acquisition. The Rabbit system is being used at the CDF.

30448 **Soudan 2 data acquisition and trigger electronics.** Dawson, J.; Haberichter, W.; Laird, R.; May, E.; Mondal, N.; Schlereth, J.; Solomey, N.; Thron, J.; Heppelman, S.; Shield, P. (Argonne National Lab., Argonne, IL 60439). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract W-31-109-ENG-38.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The 1.1 kton Soudan 2 calorimetric drift-chamber detector is read out by 16K anode wires and 32K cathode strips. Preamps from each wire or strip are bussed together in groups of 8 to reduce the number of ADC channels. The resulting 6144 channels of ionization signal are flash-digitized every 200 ns and stored in RAM. The raw data hit patterns are continually compared with programmable trigger multiplicity and adjacency conditions. The data acquisition process is managed in a system of 24 parallel crates each containing an Intel 80C86 microprocessor, which supervises a pipe-lined data compactor, and allows transfer of the compacted data via CAMAC to the host computer. The 80C86's also manage the local trigger conditions and can perform some parallel processing of the data. Due to the scale of the system and multiplicity of identical channels, semi-custom gate array chips are used for much of the logic, utilizing 2.5 micron CMOS technology.

30449 **Development of the Cerenkov Ring Imaging Detector for the SLD.** Ashford, V.; Bienz, T.; Bird, F.; Hallewell, G.; Leith, D.; McShurley, D.; Nuttall, A.; Ratcliff, B.; Reif, R.; Schultz, D. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94306). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Results of recent beam tests of a physics prototype Cerenkov Ring Imaging Detector (CRID) for the SLD are reported. The system includes both liquid (C_6F_{14}) and gas (isobutane) radiators and an 80 cm quartz TPC with a gaseous TMAE photocathode and proportional wire readout. Measurements of the quality factor (N/ sub O/) and Cerenkov angles of both radiators at various TMAE concentrations and beam momenta are presented. Other system characteristics, including electron life-times, spatial resolution, "photon feedback" and preliminary results from third coordinate charge division readout are discussed.

30450 **The recent operational performance of the CERN Omega Ring Imaging Cerenkov Detector.** Apsimon, R.J.; Flower, P.S.; Freeston, K.A.; Hallewell, G.D.; Morris, J.A.G.; Morris, J.V.; Paterson, C.N.; Sharp, P.H.; Uden, C.N. (Rutherford Appleton Lab., Chilton, Didcot, Oxon 0X11 0QX). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The authors discuss the design and construction of the Time Projection chambers (TPCs) of the Omega Ring Imaging Cerenkov Dector (RICH). Details are given of the TPC high voltage system and its monitoring and control. In addition, the operation and monitoring of the readout is described together with results of tests on the performance of the front end amplifiers. The operation of the RICH TPCs and electronics during the first data run of WA69, in 1984, is discussed together with relevant results from laboratory tests. Results from the preliminary analysis of a sample of data from the 1984 run are also presented.

30451 **Properties of a barium fluoride-TMAE-multiwire proportional chamber detector using a large single crystal.** Woody, C.L.; Petridou, C.I.; Smith, G.C. (Brookhaven National Lab., Upton, NY 11973). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The properties of a detector consisting of a large barium fluoride crystal and a multiwire proportional chamber operating at low pressure with TMAE have been studied. Measurements of the time resolution, pulse width, energy resolution, photoelectron yield and the effective energy threshold were carried out in a test beam using minimum ionizing particles. Although the detector is sensitive to signals originating from an adsorbed layer of TMAE from the crystal surface, no indication of such a signal was observed.

30452 **Analysis of digitized waveforms in a prototype of the SLD central drift chamber.** Hodges, C.; Atwood, W.B.; Carr, J.; Chadwick, G.; Csorna, S.; Hansl-Kozanecka, T.; Mundy, G.; Nauenberg, U.; Panvini, R.S.; Prescott, C.Y. (San Francisco State Univ.). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

100 MHz waveform digitizers have been used to measure drift times and charge division positions of charged particles in a prototype of the SLD central drift chamber at SLAC. Test beam results show performance to be equivalent to conventional timing and charge integration techniques.

30453 **Performance of the field-shaping strips in the TOPAZ-TPC sector.** Itoh, R.; Aihara, H.; Kamae, T.; Kusuki, N.; Shirahashi, A.; Takahashi, T. (Univ. of Tokyo, Tokyo 113). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The electric-field shaping strips are implemented in the endcap multiwire proportional chambers (sectors) of the TOPAZ-Time Projection Chamber (TPC). These strips serve to minimize both the loss of the wire gain and the distortion of the electron drift path near the end of wires. The optimum voltages on the strips were determined using Fe^{55} X-ray source and Nitrogen LASER.

30454 **Radial wire drift chambers for CDF forward tracking.** Atac, M.; Hessing, T. (Fermi National Accelerator Lab., Batavia, IL). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Radial wire drift chambers have been built for the Collider Detector of Fermilab (CDF) to cover forward and backward cone angles between 2° and 10° and 170° and 178°. The chambers are built to provide good azimuthal track resolution, good multi-track resolutions, and high rate capability. Tests done using cosmic-rays and nitrogen UV-laser beam show that single wire resolution of 110 μm and 68 μm are obtainable, respectively. Construction details and test results are presented.

30455 **SLD liquid argon calorimeter prototype test results.** Dubois, R.; Hodges, T.; Langstaff, R.; Mason, G.R.; Robertson, L.P.; Eigen, G.; Hitlin, D.; Schindler, R.H.; Warfield, K.; Zhu, Y. (Univ. of Victoria, Victoria, British Columbia). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The results of the SLD test beam program for the selection of a calorimeter radiator composition within a liquid argon system are described, with emphasis on the study of the use of uranium to obtain equalization of pion and electron responses.

30456 **Ring imaging Cherenkov detector prototype results for E665 at Fermilab.** Coutrakon, G.B.; Biggs, B.; Dhawan, S. (Fermi National Accelerator Lab., P.O. Box 500, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A proportional wire chamber (PWC) with cathode pad readout has been used to measure the position of Cherenkov photons produced by the passage of a 100 GeV muon beam in a five meter long radiator at Fermilab. The authors observe, on average, 6.2 photo-electrons per muon using Tetrakis (Dimethyl Amino) Ethylene (TMAE) as the photo ionizing vapor for detecting Cherenkov photons and 3.5 photo-electrons using triethylamine (TEA). The observed radius resolution was 3mm FWHM for the TEA data and 5mm FWHM for the TMAE data. In both cases a CaF_2 window transmitted the Cherenkov light from the radiator into the photon detector. The radiator gas was 20% argon and 80% helium producing Cherenkov rings with an average radius of 70mm. The detector described here offers the advantage of good timing resolution, (less than 100 nsec when using TEA), and high multi photon and multi ring reconstruction capability.

30457 **Performance report for Stanford/SLAC Multi-Channel Sample-and-Hold Device.** Haller, G.M.; Freytag, D.R.; Walker, J.T.; Chae, S.I. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Test results on a newly developed Multi-Channel Sample-and-Hold Calorimeter Data Unit (CDU) are presented. The device is organized as 32 input channels, each consisting of four storage cells to take samples of the 32 analog signals at four separate times. The design goals for the development were wide dynamic range and long hold times. Therefore, each storage cell is laid out in a fully differential way and consists of a sampling stage for the signal and another identical stage for a reference voltage. Results on the performance of the device are described.

30458 **Tetrode photomultiplier base for high magnetic field environments.** Yoshida, R.; Buchholz, D.; Castoldi, C.; Gobbi, B.; Schluter, R.; Tilden, R. (Dept. of Physics and Astronomy, Northwestern Univ., Evanston, IL 60201). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC02-76ER02289.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A photomultiplier base for scintillation counters has been developed to be used with a four stage multiplier, the Hamamatsu R2107. The design described incorporates a high gain, low noise amplifier, to compensate for the low charge gain, on the order of 600, of the multiplier; the base also contains a discriminator ECL output stage to drive a twisted pair cable. The tests of scintillation counters using this base have been carried out in a magnetic field of a few hundred gauss. With only one layer of ferromagnetic shielding for this photomultiplier, efficiencies of >95% were obtained for signals from minimum ionizing particles. Eighty counters of this type have been fabricated.

30459 **Position detection of 17-25 keV x-rays in krypton and xenon with a resolution of 18-50μm (FWHM).** Fischer, J.; Radeka, V.; Smith, G.C. (Brookhaven National Lab., Upton, NY 11973-5000). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC02-76CH00016.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Measurements have been made of x-ray position resolution in a proportional chamber with both Kr/10% CO_2 and Xe/10% CO_2, for the x-ray energy region 17-25 keV. Position resolutions in the range of 18-50μm (FWHM) are obtained in krypton, and in the range 50-100 μm (FWHM) for xenon. These results are interpreted in terms of the physical limitation to resolution due to the range of photoelectrons and Auger electrons emitted from the x-ray absorbing atom.

30460 **A scintillator-photodiode position detector.** Hall, G.; Robinson, D.; Seez, C.; Siotis, I. (The Blackett Lab., Imperial College, London SW7 2BZ). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A detector providing two dimensional spatial measurement of calorimeter showers is described. It consists of scintillator fingers read out by photodiodes. Results from a prototype evaluated in a test beam are given, including the effects of charged particle detection by the photodiodes.

30461 **Further measurements of electron transmission and avalanche gain in narrow lead glass tubing.** Fujieda, I.; Mulera, T.A.; Perez-Mendez, V.; Del Guerra, A. (Lawrence Berkeley Lab., Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Measurements of electron transmission and multiplication in lead glass tube arrays, in which a resistive field shaping electrode is provided by reduction of a surface-layer of lead oxide, have been continued. The transmission losses have been successfully modeled allowing the true avalanche gains to be extracted. Gains of up to 100 have been observed. Applications as a photon shield in Cherenkov imaging detectors are discussed.

30462 **SLAC Scanner Processor applications in the data acquisition system for the upgraded MARK II detector.** Barklow, T.; Glanzman, T.; Lankford, A.J.; Riles, K. (Stanford Linear Accelerator Center, Stanford Univ., Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The SLAC Scanner Processor is a general purpose, programmable FASTBUS crate/cable master/slave module. This device plays a central role in the readout, buffering and preprocessing of data from the upgraded Mark II detector's new central drift chamber. In addition to data readout, the SSPs assist in a variety of other services, such as detector calibration, FASTBUS system management, FASTBUS system initialization and verification, and FASTBUS module testing.

30463 **The FASTBUS Segment Extension as a crate coupling concept.** Machen, D.R. (Scientific Systems International, Los Alamos, NM). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The Segment Extension is a recent development in FASTBUS hardware that will require changes in the controlling software now being written for physics data acquisition systems. Applications involving the Segment Extension include the logical expansion of the front-end instrumentation crates holding electronics for the hundreds of particle detector channels planned for LEP experiments at CERN, the SLC experiments at SLAC, and CDF experiments at FERMILAB. This paper discusses the characteristics of the Segment Extension and the FASTBUS system-software requirements and hardware requirements imposed by the device.

30464 **A FASTBUS logic analyzer based on SLAC SNOOP diagnostic modules.** Zimmerman, S. (Fermi National Accelerator Lab., Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A FASTBUS based data acquisition system is being developed at Fermi National Accelerator Laboratory for the Collider Detector. Due to the complexity of this system, some form of diagnostic module had to be developed to help find, in real time, hardware and software problems on any segment of this system. One such module, the SNOOP module, was developed at Stanford Linear Accelerator Center. It provides monitor and test capabilities to FASTBUS. To develop this FASTBUS Logic Analyzer, two SNOOP Modules will be interconnected to a host, and software is being written to use their monitoration capabilities. This system will have the capability of following, in real time, FASTBUS messages through the system. The hardware interconnection and various diagnostic features will be discussed, and performance will be given.

30465 **FASTBUS rack alarms and limits.** Haldeman, M.; Zimmerman, S. (Fermi National Accelerator Lab., P.O. Box 500, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A FASTBUS based data acquisition system is under construction at the Fermi National Accelerator Laboratory for the Collider Detector at FERMILAB (CDF). This system is likely to have in the area 35 to 40 racks, 25 of which may house up to 3 FASTBUS crates, associated power supplies and cooling aparatus. Such a rack may represent as much as $175,000. This paper describes a rack protection system, designed to greately reduce the possibility of large scale system damage, which will add an additional cost of approximately 1 to 2 %.

30466 **FASTBUS cooling.** Haldeman, M.; Holm, S.; Merkel, B. (Fermi National Accelerator Lab., P.O. Box 500, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

In 1983, at FERMILAB, the authors began looking at ways to construct a large FASTBUS data manipulation system for the Collider Detector at FERMILAB; a system consisting of about 35 FASTBUS racks each housing up to three FASTBUS crates. Each crate may be required to dissipate up to 2.5 kw of electrical power in the form of heat. This paper describes some of the tests run, the test results, and the final system configuration.

30467 **Design and performance of a CCD based readout for the DELPHI barrel electromagnetic calorimeter.** Crawley, H.B.; Holland, G.E.; Homer, J.F. Jr.; McKay, R.; Meyer, W.T.; Rosenberg, E.I.; Thomas, W.D. (Dept. of Physics and Ames Lab., USDOE, Iowa State Univ., Ames, IA 50011). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The authors describe the design criteria and performance of a CCD based readout system developed for use in the DELPHI experiment at LEP. These circuits are designed for use on the cathode pads of the High Density Projection Chamber (HPC) which will serve as the DELPHI central region electromagnetic calorimeter. Two separate CAMAC versions of this system have been tested on prototype HPC modules exposed to both hadrons and electrons. Stability and performance characteristics of these circuits at CCD input frequencies up to 20 MHz are presented. They also present results on the electron shower energy resolution for the HPC prototypes.

30468 **A large dynamic range charge amplifier ADC for the Fermilab collider detector facility.** Drake, G.; Droege, T.F.; Hahn, S.R.; Van Berg, R.; Williams, H.H.; Liss, T.M.; Wagner, R.G.; Inaba, S. (Argonne National Lab.). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A multi-channel charge amplifier ADC system for use with electromagnetic and hadronic calorimetry has been built with X1 and X16 amplifier channels which extend the range of the single 16 bit ADC to the equivalent of a 20 bit system having 0.7 fC least significant resolution. Two on-board calibration schemes, a fast analog trigger output, and redundant readout are also included. The point-wise error in linearity (expressed as the maximum error as a percentage of the full charge scale) is less than 0.02% for the X1 channels, and less than 0.002% for the X16 channels. Other features include a before/after signal differencing scheme which provides low frequency noise rejection and compensation for baseline drifting, and temperature stability on the order of 30 ppm/C.

30469 **A real time data compactor (sparsifier) and 8 megabyte high speed FIFO for HEP.** Baumbaugh, A.E.; Knickerbocker, K.L.; Wegner, C.R.; Ruchti, R. (Fermi National Accelerator Lab., Batavia, IL). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A Video-Data-Acquisition-System (VDAS) has been developed to record image data from a scintillating glass fiber-optic target developed for High Energy Physics. The major components of the VDAS are a flash ADC, a "real time" high speed data compactor, and high speed 8 megabyte FIFO memory. The data rates through the system are in excess of 30 megabytes/second. The compactor is capable of reducing the amount of data needed to reconstruct typical images by as much as a factor of 20. The FIFO uses only standard NMOS DRAMS and TTL components to achieve its large size and high speed at relatively low power and cost.

30470 **MARK II end cap calorimeter electronics.** Kirsten, F.A.; Lee, K.L.; Olson, S.R.; Wood, D.R. (Lawrence Berkeley Lab., Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

An end cap calorimeter system has been added to the MARK II detector in preparation for its use at the SLAC Linear Collider. The calorimeter uses 8744 rectangular proportional counter tubes. This paper describes the design features of the data acquisition electronics that has been installed on the calorimeter. The design and use of computer-based test stands for the amplification and signal-shaping components is also covered. A portion of the complete system has been tested in a beam at SLAC.

30471 A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers. Yarema, R.J.; Binkley, M.; Foster, W.; Kadel, R.; Kephart, R.; Wagner, R.; Zimmerman, T.; Kondo, K. (Fermi National Accelerator Lab., P.O. Box 500, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A custom monolithic common base preamplifier chip was designed for Fermilab's Colliding Detector Facility Vertex Time Projection Chamber. The chip contains 4 preamplifiers on a single substrate. All of the associated circuitry as well as the preamplifiers are surface mounted on a thin printed circuit board to reduce the mass of the circuit. A low mass circuit is essential to reduce unwanted particle interactions with the circuit which could interfere with the physics seen by other layers of detectors. The Amplifier-Shaper-Discriminator (ASD) following the wire preamplifier was designed for use with several of the CDF Central Detector tracking chambers. Surface mount components are used extensively on the ASD's to reduce the number of circuit cards and number of crates in the system. Both the new preamplifier and the large scale use of surface mounted components reported in this paper are expected to find wide spread use in new detector electronics.

30472 Radiation damage studies on BaF_2 and BGO scintillator materials. Caffrey, A.J.; Heath, R.L.; Ritter, P.D.; Van Siclen, C.D.; Anderson, D.F.; Majenski, S. (Idaho National Engineering Laboratory, Idaho Falls, ID 83415). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Radiation damage effects in BGO and BaF_2 have been studied in samples of commercial material. Optical transmission and scintillator response have been measured for integrated beta/gamma doses up to 8×10^7 R. Measurements, at dose rates up to 10^6 R/hr., indicate that both materials are quite resistant to damage, with BaF_2 samples exhibiting superior recovery with time. Results of preliminary measurements are presented and discussed. Comparison of these data with previous measurements in the literature indicate that material purity correlations must be established to provide a basis for predicting radiation damage characteristics of scintillator materials. The case for further work in this area is discussed.

30473 Properties of new scintillation glasses and scintillating fibers. Bross, A.D. (Lawrence Berkeley Laboratory, University of California, Berkeley 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The authors present data on the light output and optical properties of new scintillation glasses. Data on light (rho $\simeq$ 2.6g/cm^3) and heavy (rho $>$ 3.4g/cm^3) glasses are presented. In addition, the performance of scintillating glass fibers fabricated using a new light glass is discussed.

30474 A cerium glass fiber-optic active target for high energy physics experiments. Ruchti, R.; Baumbaugh, B.; Bishop, J.; Biswas, N.; Busenitz, J.; Cason, N.; Cunningham, J.; Gardner, R.; Grenquist, S.; Kenney, V. (Fermi National Accelerator Laboratory, Batavia, IL 60510). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A fiber-optic plate imaging system has been developed for active target and tracking applications, in which the active element is Ce(3+) in a silicate glass. Particle tracks and interactions have been recorded with a hit density of $\geq$ 4/mm for minimum ionizing particles and with a spatial resolution $\sigma \approx 28\mu$ m.) The properties of cerium scintillation glass are discussed.

30475 Performance of radiation hard CCDs as tracking devices. Bross, A.D.; Clegg, D.B. (Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The authors present data on the operation of radiation hard CCDs used as tracking devices. The system consisted of 5 Texas Instruments CCDs with a total number of cells equal to 2.7×10^6. The tracking resolution for minimum ionizing particles was measured to be σ/sub X/ = 4.8 +- 0.2 microns and σ/sub Y/ = 5.0 +- 0.3 microns. Two track separation of better than 40 μm in space was also obtained.

30476 Performance of the SLD Central Drift Chamber prototype. Young, C.C.; Atwood, W.B.; Carr, J.; Chadwick, G.; Csorna, S.; Hansl-Kozanecka, T.; Hodges, C.L.; Mundy, G.; Nauenberg, U.; Panvini, R. (San Francisco State University, San Francisco, CA 94132). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A two-cell prototype of the SLD Central Drift Chamber has been tested using CO_2-isobutane (92%-8%) at one atmosphere. Average single wire resolution of 55 μm was achieved. Charge division tests indicate a resolution for the final design of $\simeq$ 0.5% of wire length. dE/dx separation of π - e should be useful up to at least 7 GeV/c.

30477 Performance of the SLD Warm Iron Calorimeter pre-prototype. Johnson, A.S.; Busza, W.; Friedman, J.; Kendall, H.; Kistiakowsky, V.; Lyons, T.; Osborne, L.S.; Rosenson, L.; Verdier, R.; Carumbalis, D. (Massachusetts Institute of Technology, Cambridge, MA 02139). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC02-76ER03069.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The performance of a pre-prototype of the SLD Warm Iron Calorimeter (WIC) build with proportional tube cathode pad readout has been studied. The calorimeter was found to have an average resolution of 36.7 +- 0.2% for muons at 2.0, 5.0 and 10.5 GeV and 81 +- 2% $\sqrt{E}$ for pion showers at 5.0 and 10.5 GeV. The mean energy found for the pion showers was consistent with a linear dependance on energy within these standard deviations.

30478 Charge division using carbon filaments for obtaining coordinate information from detection of single electrons. Bird, F.; Shapiro, S.; Ashford, V.; McShurley, D.; Reif, R.; Leith, D.W.C.S.; Williams, S. (Stanford Linear Accelerator Center, Stanford University, Stanford, CA 94305). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC03-76SF00515.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Seven micron diameter carbon filaments forming the anode of a multiwire proportional chamber have been used to detect single electrons. Charge division techniques applied to the 5 cm long wire resulted in a position resolution of $\sigma/L < 2\%$ for a collected signal charge of 30 fC.

30479 Method and apparatus for determining the content and distribution of a thermal neutron absorbing material in an object. Crane, T.W. (to Dept. of Energy). US Patent 4,565,926. 21 Jan 1986. Filed date 21 Dec 1983. vp.

This patent describes an apparatus for determining the content and distribution of a thermal neutron absorbing material within an object. The apparatus consists of: a. means for generating neutrons having an energy higher than thermal neutrons; b. means for

thermalizing the higher energy neutrons, the neutron thermalizing means being disposed between the neutron generating means and the object; c. neutron detecting means for counting thermal neutrons, the neutrons detecting means including and active portion, the active portion being centrally disposed within the neutron detecting means and in substantial alignment with the neutron generating means; and d. shield means interposed between the object and the neutron detecting means, the shield means comprising an effective thermal neutron absorbing material and having portions defining an orifice, the orifice disposed in substantial alignment between the active portion and the neutron generating means, wherby the number of neutrons absorbed by the object per unit time is determined by comparing the neutron flux at the neutron detecting means when the object is located between the neutron thermalizing means and the shield means with the neutron flux when the object is absent.

30480 **New focal plane detector for the magnet spectrometer Big Karl.** Atencio, L.G.; Morris, C.L.; Berg, G.P.A.; Brinkmoeller, B.; Meissburger, J.; Paul, D.; Roemer, J.G.M.; Rogge, M.; Rossen, P. von; Sagefka, T. . (Los Alamos National Lab., NM, United States of America; Kernforschungsanlage Juelich G.m.b.H., Germany, F.R. Inst. fuer Kernphysik; Koeln Univ., Germany, F.R. Inst. fuer Kernphysik; Technische Univ. Muenchen, Federal Republic of Germany; Texas Univ., Austin, United States of America). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **242**: No. 1, 95-102(15 Dec 1985).

Two delay-line readout drift chambers with an active area of 90 cm by 7 cm are now in use as focal plane detectors at the high resolution spectrometer Big Karl. The position resolution is better than 0.2 mm fwhm with detector efficiencies exceeding 99.5% for 45 MeV deuterons. Light ions such as protons, deuterons, alphas and others up to ^{6}He have been measured at energies between 15 and 45 MeV per nucleon. The new detector offers a significantly higher focal plane acceptance with improved background suppression and correction capabilities.

30481 **High-purity germanium charged-particle detectors: A LBL-IUCF update.** Pehl, R.H.; Luke, P.N.; Friesel, D.L. (Lawrence Berkeley Lab., CA, United States of America; Indiana Univ., Bloomington, USA. Cyclotron Facility). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **242**: No. 1, 103-110(15 Dec 1985).

During the continued use and corresponding analysis of the performance of high-purity germanium charged-particle detectors, two important conclusions were reached: (1) Germanium transmission detectors should not be made from material that is "too" pure. It is desirable to have the largest possible net donor concentration consistent with maintaining a reasonable value for the depletion bias. (2) It is very desirable to use detectors fabricated from n-type germanium in a high-radiation environment.

30482 **Segmented position-sensitive plastic phoswich detector.** Schmidt, H.R.; Bantel, M.; Chan, Y.; Gazes, S.B.; Wald, S.; Stokstad, R.G. (Lawrence Berkeley Lab., CA, USA. Nuclear Science Div.). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **242**: No. 1, 111-116(15 Dec 1985).

For the detection of light particles we have built a multi-element detector, consisting of eight position-sensitive strips. The total active area is 20 x 20 cm^2. The strips are of the phoswich type, having a thin element of fast NE102 (decay time tau=2.5 ns) and a thick element of slow NE115 (tau=225 ns). The position information is obtained by making use of light attenuation through surface losses. The detector is able to identify protons, deuterons and α particles. The position and energy resolutions were found to vary from 4 to 18 mm (fwhm) and 2.2 to 5.8% (fwhm), respectively, for α energies ranging from 87 to 35 MeV. The detector has been used in experiments for the coincident measurement of light particles produced in heavy-ion-induced reactions.

30483 **Influence of electron momentum on the shape of backscatter peaks in gamma-ray spectrometers.** MacKenzie, I.K.; Hurst, J. (Guelph Univ., Ontario, Canada. Dept. of Physics; Brookhaven National Lab., Upton, NY, USA. Physics Dept.). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **242**: No. 1, 137-142(15 Dec 1985).

The shape and intensity of backscatter peaks in pulse-heigth spectra have a complicated dependence on details of detector design, gamma-ray energy and geometry. In addition they show a remarkably strong systematic dependence on the atomic number of the scattering material and even manifest specifically solid state effects. The external backscatter peak can be regarded as a weighted composite of Compton profiles with an unexploited potential for revealing small changes in the electron momentum spectra of the scattering material. Its sensitivity in this role could be improved by the use of detectors with very thick depletion layers and by a redesign of the coldfinger to diminish the internal backscatter peak. By reduction of the source energy and the use of a small absorber post, the system evolves into a new type of Compton-profile spectrometer of outstanding efficiency and small dimensions.

30484 **Plastic scintillator response to relativistic nuclei, Z<=28.** Dwyer, R.; Zhou Dazhuang. (Chicago Univ., IL, USA. Enrico Fermi Inst.). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **242**: No. 1, 171-176(15 Dec 1985).

This paper deals with the nonlinearity in the response of Pilot Y plastic scintillators to the energy loss of ionizing particles. The data on which the analysis is based are derived from a balloon-borne cosmic-ray experiment to investigate nuclei over the charge range from Z=1 through Z=28 (nickel), and over an energy from 0.7 to 10 GeV/n. Comparison of the data is made with two variants of a simple core-halo model and good agreement between the measurements and the models is found for this charge and energy range.

30485 **Highly segmented NaI(Tl) detector with vacuum photodiode readout for measuring electromagnetic showers at the CERN ISR.** Batley, R.; Berset, J.C.; Breuker, H.; Dam, P.; Fabjan, C.W.; Goerlach, U.; Harris, M.; Jensen, T.; Lindsay, J.; Mannelli, I. (European Organization for Nuclear Research, Geneva, Switzerland; Bonn Univ., Germany, F.R. Physikalisches Inst.; Pisa Univ., Italy; Moskovskij Inzhenerno-Fizicheskij Inst., Union of Soviet Socialist Republics; Pittsburgh Univ., PA, United States of America). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **242**: No. 1, 75-88(15 Dec 1985).

In this report we describe construction and performance of two identical units of electromagnetic shower counters which were installed in the axial-field spectrometer at the CERN-ISR in 1982 to provide improved detection of photons and electrons over a 1.3 sr solid angle of the AFS calorimeter. Thallium doped sodium-iodide in the form of small blocks served as an active shower material. Vacuum photodiodes and low-noise charge sensitive electronics were used for the deposited energy measurement and signal amplification. The stable performance of the detectors over a period of more than 18 months until the closure of the ISR has proven that vacuum photodiodes can reliably be utilized in highly modularized large scale detectors operating in a high magnetic field environment.

30486 **Improved constant-Q spectrometer for pulsed neutron sources.** Robinson, R.A.; Pynn, R.; Eckert, J. (Los Alamos National Lab., NM, USA. Physics Div.). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **241**: No. 2/3, 312-324(1 Dec 1985).

We describe a constant-Q spectrometer which has been installed recently at the Los Alamos Neutron Scattering Center. Although the instrument is based on the concept proposed originally by Windsor, it incorporates a number of important improvements. Features which facilitate spectrometer alignment include a 90° line-up detector flight path which can be collimated both vertically and

horizontally and an analyser crystal which is mounted in a way which allows it to be translated accurately in the scattering plane. The latter feature permits the analyser to be moved to the sample position so that its rocking curve can be measured in the line-up detector. A new multi-element analyser crystal is proposed and tested. It exploits the anisotropic mosaic distribution of plastically deformed germanium single crystals in a new way. As test experiments, we have measured incoherent scattering from ZrH_2 and the scattering by phonons in an aluminium single crystal. The data from the latter experiment are presented as an intensity map over a plane in energy-wavevector space and a number of constant-Q scans have been constructed from this map. The results are in agreement with previous work on aluminium and serve to demonstrate the power of the constant-Q spectrometer as a survey instrument. Both dispersive and non-dispersive phonon branches have been recorded. Their line-widths are in agreement with a calculation of the instrumental resolution which is presented in appendix A. A further appendix presents a prescription for data normalisation.

30487 **Neutron polarimeter for (p, n) measurements at intermediate energies.** Taddeucci, T.N.; Goodman, C.D.; Byrd, R.C.; Carey, T.A.; Horen, D.J.; Rapaport, J.; Sugarbaker, E. (Ohio Univ., Athens, United States of America; Indiana Univ., Bloomington, United States of America; Indiana Univ., Bloomington, United States of America; Los Alamos National Lab., NM, United States of America; Oak Ridge National Lab., TN, United States of America). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **241**: No. 2/3, 448-460(1 Dec 1985).

A large-volume large-acceptance neutron polarimeter consisting of two parallel planes of plastic scintillators has been used to measure transverse polarization transfer in (p, n) reactions in the energy range 80 MeV < Esub(p) < 160 MeV. The effective analyzing power obtained from ^{1}H(n vector, n)^{1}H reactions in the plastic scintillator has been measured by observing neutrons from the ^{14}C(p vector,n vector)^{14}N(2.31 MeV) reaction at theta=0°. Neutron energies are determined by time-of-flight with a resolution of about 1 MeV for 160 MeV neutrons. At this same energy the effective left-right analyzing power is 0.34 +- 0.02 and the effective area is (1.9 +- 0.3) cm^2. (orig.).

30488 **Feasibility tests of a high resolution sampling radial drift chamber.** Huth, J.; Nygren, D. (Massachusetts Univ., Amherst, USA. Dept. of Physics and Astronomy; Lawrence Berkeley Lab., CA, United States of America). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **241**: No. 2/3, 375-386(1 Dec 1985).

The design concept and results of feasibility tests for a vertex detector intended for use in the TPC-PEP4/9 experiment are presented. The detector is based on a slow radial drift in dimethyl ether. High resolution localization of the avalanches at the sense wire is accomplished with nearby pickup wires and the utilization of waveform sampling electronics. The avalanche angular coordinate measurements, combined with knowledge of the electric field distribution and drift velocity permit reconstruction of the trajectory using essentially all track information. Measurements with a test chamber constructed to study characteristics of avalanche localization indicate that the recoverable track information in one centimeter of dimethyl ether at 1.5 atm is equivalent to 30 measurements of 40 μm accuracy.

30489 **Fast timing light pulser for scintillation detectors.** Kapustinsky, J.S.; DeVries, R.M.; DiGiacomo, N.J.; Sondheim, W.E.; Sunier, J.W.; Coombes, H. (Los Alamos National Lab., NM, United States of America; British Columbia Univ., Vancouver, Canada. TRIUMF Facility). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **241**: No. 2/3, 612-613(1 Dec 1985).

Letter-to-the-editor.

We report on the development of a compact, inexpensive and fast light pulser system designed to set up the timing of scintillators in a medium energy physics spectrometer.

30490 **CALLIOPE - a large acceptance multiparticle magnetic spectrometer for intermediate energy physics.** Sunier, J.W.; Bol, K.D.; Clover, M.R.; DeVries, R.M.; DiGiacomo, N.J.; Kapustinsky, J.S.; McGaughey, P.L.; Sondheim, W.E. (Los Alamos National Lab., NM, USA. Physics Div.). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **241**: No. 1, 139-152(15 Nov 1985).

A magnetic spectrometer with an angular acceptance of 360° and a solid angle of 0.5 sr is described. It can detect and identify light charged particles in the momentum range 0.1 GeV/c < p, 1.2 GeV/c, with a momentum resolution of 1 to 10%. It can be configured to allow inclusive single particle as well as correlated multiparticle (< or approx. 10) measurements. The performance of the spectrometer is discussed in light of p+A->πsup(+-)+X and anti p+A->πsup(+-),Ksup(+-), p, anti p, d+X experiments conducted at LAMPF, TRIUMF and LEAR (CERN).

30491 **Performance of the cylindrical drift chamber for the crystal box at LAMPF.** Bolton, R.D.; Cooper, M.D.; Frank, J.S.; Hart, V.E.; Matis, H.S.; Mischke, R.E.; Sandberg, V.D.; Sandoval, J.P.; Sennhauser, U. (Los Alamos National Lab., NM, United States of America). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **241**: No. 1, 52-61(15 Nov 1985).

A cylindrical drift chamber has been built and tested for use as an electron tracking device in the Crystal Box detector at LAMPF. It has 728 drift cells in eight planes with radii of 105 to 220 mm and with alternating stereo angles of 10° to 16°. Resolutions of sigma=130 μm and track reconstruction efficiencies of 97% were obtained for simple events from cosmic rays and from muon-decay electrons at instantaneous rates of 2 MHz. The resolution and complete event reconstruction efficiency were degraded to 180 μm and 75%, respectively, for events with at least three tracks at muon stopping rates of 8 MHz.

30492 **Pulsed-neutron monochromator.** Mook Jr., H. A. (to The United States of America as represented by the United States Department of Energy). US Patent 4,543,230. 24 Sep 1985. Filed date 31 Mar 1983. vp.

PAT-APPL-480634.

In one aspect, the invention is an improved pulsed-neutron monochromator of the vibrated-crystal type. The monochromator is designed to provide neutron pulses which are characterized both by short duration and high density. A row of neutron-reflecting crystals is disposed in a neutron beam to reflect neutrous onto a common target. The crystals in the row define progressively larger neutron-scattering angles and are vibrated sequentially in descending order with respect to the size of their scattering angles, thus generating neutron pulses which arrive simultaneously at the target. Transducers are coupled to one end of the crystals to vibrate them in an essentially non-resonant mode. The transducers propagate transverse waves in the crystal which progress longitudinally therein. The wave are absorbed at the undriven ends of the crystals by damping material mounted thereon. In another aspect, the invention is a method for generating neutron pulses characterized by high intensity and short duration.

30493 **Effective threshold cross sections for sulphur and indium fast neutron reactions.** Swaja, R.E.; Ragan, G.E. (Oak Ridge National Lab., TN, United States of America). *Radiation Protection Dosimetry;* **12**: No. 3, 303-305(1985).

Effective threshold cross sections were calculated for the ^{32}S(n,p)^{32}P and ^{115}In(n,n')sup(115m)In fast neutron reactions for various energy spectra associated with the Health Physics Research Reactor (HPRR) and for a ^{235}U fission spectrum. Values of 238 mb at 2.5 MeV for sulphur and 280 mb at 2.4 MeV for indium are recommended for evaluation and calibration of neutron activation type criticality accident dosimetry systems in HPRR, ^{235}U fission, or similar energy spectra.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

REFER ALSO TO CITATION(S) 30427, 30459

30494 **Radiation effects on video imagers.** Yates, G.J.; Bujnosek, J.J.; Jaramillo, S.A.; Walton, R.B.; Martinez, T.; Black, J.P. (Los Alamos National Lab., Group P-15, MS D406, P.O. Box 1663, Los Alamos, NM 87545). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* **NS-33**: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Radiation sensitivity of several photoconductive, photoemissive, and solid state silicon-based video imagers was measured by analysing stored photocharge induced by irradiation with continuous and pulsed sources of high energy photons and neutrons. Transient effects as functions of absorbed dose, dose rate, fluences, and ionizing particle energy are presented.

30495 **Radiation damage test of barium fluoride scintillator.** Majewski, S.; Anderson, D. (Fermi National Accelerator Lab., Batavia, IL, USA. Particle Detector Group). *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment;* **241**: No. 1, 76-79(15 Nov 1985).

Small samples of BaF_2 scintillator have been irradiated in a high-energy proton beam with doses of up to 1.3×10^7 rad. To the precision of our measurement there was no effect in the scintillation output and only a slight decrease in transmission was observed.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 29203, 29253, 29600, 30667

30496 **(DP—1714) Fiber optic modification of a diode array spectrophotometer.** Van Hare, D.R.; Prather, W.S. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jan 1986. Contract AC09-76SR00001. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009572.

Fiber optics were adapted to a Hewlett-Packard diode array spectrophotometer to permit the analysis of radioactive samples without risking contamination of the instrument. Instrument performance was not compromised by the fiber optics. The instrument is in routine use at the Savannah River Plant control laboratories.

30497 **(INPE—561-NTE/236) Pyranometer comparison at INPE, Atibaia, in August 1983.** Anhalt, J. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Jun 1985. 13p. NTIS, PC A02/MF A01.

Pyranometers and pyroheliometers are used for collecting meteorological data or solar collector tests. The calibration constants of these instruments vary with time and have to be recalibrated in certain intervals. The recalibration of four pyranometers and one pyrheliometer under tropic climate conditions using secondary standard instruments, and calibration standards together with data acquisition system are discussed. The results obtained can not be explained by the aging of these instruments.

30498 **(ORNL/Sub—84-19712/1) High temperature calorimeter performance variable study.** Troyer, R. (Manville Service Corp., Denver, CO (USA)). Apr 1986. Contract AC05-84OR21400. 96p. NTIS, PC A05/MF A01; GPO Dep. File Number DE86010074.

Oak Ridge National Laboratory with funding supplied by the Department of Energy sponsored the evaluation of a water calorimeter for thermal transmission testing of refractory fiber insulation using a ruggedness test. The specimens tested were low density refractory fiber flexible blanket insulation. The factors evaluated included (1) emissivity of copper plate; (2) calorimeter to guard balance; (3) calorimeter to room temperature balance; (4) calorimeter water flow rate; (5) perimeter insulation; (6) type of hot side thermocouple and (7) type of cold side thermocouple. A ruggedness test is a statistical method of evaluating step changes making multiple changes each test. Five of the seven factors were found to be significant at a minimum of one temperature. One plate versus three plates, two inch thick specimen versus three inch thick specimen and a release agent were three factors that were tested independently of the ruggedness test. The specimens were also tested in a guarded hot plate for comparison purposes. Recommendations are given to improve the design and operation of the calorimeter.

30499 **(SLAC-PUB—3867) Rotor electrometer for fractional charge searches.** Innes, W.; Perl, M.; Price, J.C. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Jan 1986. Contract AC03-76SF00515. 3p. (CONF-860680—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86006954.

From CPEM conference; Gaithersburg, MD, USA (23 Jun 1986).

Work on a device for searching large samples of any composition for fractional charge is described. A resolution of 0.3 electron charges has been achieved for photo-induced charge changes.

30500 **(UCID—20719) Accurate measurement of small rotations by modulating polarization. Final report.** Robinson, W.L.; Gillespie, C.H. (Lawrence Livermore National Lab., CA (USA)). Apr 1986. Contract W-7405-ENG-48. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009933.

An instrument developed to accurately measure small rotations (twist about an optical axis) uses a Faraday rotator to modulate the polarization of a HeNe laser beam. Twist sensors located in the beam path consist of a calcite polarizer (analyzer), a silicon detector, and associated electronics. The sensors measure relative changes of the sensor analyzer and the null position of the modulated source beam. Reference measurements of the laser intensity and beam modulation are made to avoid accurately characterizing the modulation amplitude. This instrument has a sensitivity of 0.2 microradians at 5 Hz bandwidths over a 17.5 milliradian measuring range. This is accomplished by controlling the laser beam wander, reducing laser divergence, and utilizing synchronous detection.

30501 **Multiple-stage integrating accelerometer.** Devaney, H.F. (to Dept. of Energy, Washington, DC). US Patent 4,574,168. 4 Mar 1986. Filed date 27 Jun 1984. vp.

An accelerometer assembly is described for use in activating a switch or the like responding to multiple acceleration pulses in series, comprising: a housing forming a chamber having a first and second end; a mass slidably disposed in the chamber and movable during acceleration from the first end toward the second end; means for biasing the movable mass toward a reset position adjacent the first end; means for damping the movement of the mass in the chamber; cam and follower means carried by the movable mass and the housing for relative movement in response to the acceleration, the cam and follower means including means for temporarily blocking the mass movement toward the second end after a first acceleration pulse; the cam and follower means cooperating together to allow continued movement toward the second end and switch activation in response to at least a second separate acceleration pulse in series with the first.

30502 **Sidetone generator flowmeter.** Fritz, R.J. (to Dept. of Energy). US Patent 4,572,003. 25 Feb 1986. Filed date 3 Nov 1983. vp.

A device is described for measuring the velocity of fluid flow along an enclosed path in a velocity range in which the Strouhal number is constant. The device consists of: sidetone generator means, comprising a cavity in a wall defining the flow path for the fluid flow, for generating a side tone during the flow of fluid past the cavity in the velocity range in which the Strouhal number is constant, the dimensions of the cavity being such as to produce a dominant vibratory frequency within the cavity; pressure sensing means for sensing the dominant vibratory frequency produced in the cavity responsive to the flow of fluid past the cavity; and meter meand responsive to the dominant vibratory frequency sensed by the pressure sensing means for providing an indication of the flow

velocity of the fluid flowing past the cavity; the cavity being formed in the wall of a pipe and comprising a recess in the pipe wall, and a chamber being formed on the upstream edge of the recess.

30503 **Method and apparatus for molecular imaging using x-rays at resonance wavelengths.** Chapline Jr., G. F. (to The United States of America as represented by the United States Department of Energy). US Patent 4,536,883. 20 Aug 1985. Filed date 30 Nov 1982. vp.

PAT-APPL-445596.

Holographic X-ray images are produced representing the molecular structure of a microscopic object, such as a living cell, by directing a beam of coherent X-rays upon the object to produce scattering of the X-rays by the object, producing interference on a recording medium between the scattered X-rays from the object and unscattered coherent X-rays and thereby producing holograms on the recording surface, and establishing the wavelength of the coherent X-rays to correspond with a molecular resonance of a constituent of such object and thereby greatly improving the contrast, sensitivity and resolution of the holograms as representations of molecular structures involving such constituent. For example, the coherent X-rays may be adjusted to the molecular resonant absorption line of nitrogen at about 401.3 eV to produce holographic images featuring molecular structures involving nitrogen.

30504 **Raman accumulator as fusion laser driver.** George, E. V.; Swingle, J. C. (to The United States of America as represented by the Department of Energy). US Patent 4,529,943. 16 Jul 1985. Filed date 31 Mar 1982. vp.

PAT-APPL-363971.

Apparatus for simultaneous laser pulse amplification and compression, using multiple pass Raman scattering in one Raman cell and pulse switchout from the optical cavity through use of a dichroic device associated with the Raman cell.

30505 **Portable monitor for solar radiation that accumulates irradiance histograms for 32 leaf-mounted sensors.** Gutschick, V.P.; Barron, M.H.; Waechter, D.A.; Wolf, M.A. (Los Alamos National Lab., NM). *Agricultural and Forest Meteorology;* 33: 281-290(1985).

A novel and inexpensive instrument to monitor solar radiation interception at up to 32 locations simultaneously is described. It employs small-area, lightweight sensors that are leaf-mountable and have very good spectral and angular responses. A portable computer readily controls fast data acquisition and in-field processing to histograms, which are the most general irradiance measures to relate to nonlinear plant responses such as photosynthesis. Two field tests verified the instrument's reliability and operational convenience, and also directly compared radiation interception at space-fixed locations vs. nearby leaves. A number of new physiological and canopy-model tests that the instrument makes possible are described. The monitor is constructed from standard electronic components and may be readily modified for many expanded capabilities. 20 references, 2 figures, 1 table.

30506 **Modification of a commercially available ICP for application to radioactive analyses.** Lautensleger, A.; Hara, F. (Pacific Northwest Lab., Richland, WA). *American Laboratory;* 82-91(Mar 1984). Contract AC06-76RL01830.

Many factors must be considered when choosing a commercially available ICP for application to radioactive remote glove box operations. The sample/radiation containment part of the system is to be a lead-lined glove box with relatively thick leadlined gloves. Consequently, all source stand maintenance and sample handling will have to be conducted at considerably reduced operator dexterity. The less physical operator input that is required for routine maintenance and analyses, the better. Two major points need to be addressed in setting minimum design criteria for the glove box: confinement of the radiation, to help keep operator radiation exposure levels as low as possible; and confinement of the radionuclides.

4404 Well Logging Instrumentation

30507 **(AREAEE—273) Simulated borehole for ore depth evaluation by neutron capture gamma-ray technique using Pu/Be neutron source.** Hussein, A.Z.; Hassan, A.M.; Ahmed, H.G.; El-Kady, A.A. (Nuclear Research Centre, Inshas (Egypt)). 1982. 26p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701795.

In this work an attempt was made to study the response as well as the effective depth of a borehole sonde designed and tested for possible in situ ore analysis. A laboratory model to function as a borehole probe for elemental analysis by neutron capture gamma-ray technique, was designed to work both in laboratory and in situ. The borehole sonde consists of an aluminium borehole casing 700 mm deep and 120 mm inner diameter. It contains a 5 Ci, Pu/Be isotopic neutron source, a shadow shield and the Ge(Li) detector. The assembly was designed and constructed for high gamma-ray sensitivity, low interference and minimum radiation damage to the Ge(Li) detector. The depth investigations were done by progressively measuring the neutron capture gamma-spectrum from domestic hematite ore sample at various diameters. Results of the analysis of the prompt gamma-ray spectrum from the hematite ore sample using the described sonde have been presented. The optimum depth at which the sonde is effective and the depth beyond which no significant contribution to the capture gamma-spectrum were determined.

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 29263

30508 **(EUR—9541-Pt.1) On the adequacy of numerical codes for the simulation of vapour cloud explosions. Pt. 1.** Wingerden, G.J.M.v.; Berg, A.C.v.d. (Commission of the European Communities, Luxembourg). 1984. 101p. NTIS (US Sales Only), PC A06/MF A01. File Number DE86751608.

Three spherically symmetric blast simulation codes have been evaluated: a low-flame-speed model (Piston model) and two gasdynamic blast simulation codes (BLAST and CLOUD). Self-similar flow fields in front of constant velocity flames and large- and small-scale spherically symmetric explosions experiments were simulated. The Piston model can be used for the simulation of spherically symmetric explosions at flame speeds $< 100\ ms^{-1}$ whereas BLAST and CLOUD are adequate for flame speeds exceeding $100\ ms^{-1}$. An adapted Piston code has been investigated with respect to the capability of simulating blast due to explosions of pancake-shaped clouds. Comparison to an acoustic approach showed that the Piston model can be regarded as an acoustic model with the possibility of handling every imaginable flame path. The research was part of the indirect action research programme on LWR Safety of the Commission of the European Communities. (project 12B, contract 008 SRN).

30509 **(EUR—9676-Vol.1) Gas explosion characterization, wave propagation (small-scale experiments). Vol. 1.** Larsen, G.C. (Commission of the European Communities, Luxembourg). 1985. 150p. NTIS (US Sales Only), PC A07/MF A01. File Number DE86751640.

A number of experiments have been performed with blast waves arising from the ignition of homogeneous and well defined mixtures of methane, oxygen and nitrogen, contained within spherical balloons with controlled initial dimensions. In the initial small scale experiments pressure characteristics, ground reflection phenomena and pressure distribution on box like obstacles were studied. Both configurations with one box and two closely spaced boxes have been considered, and a wave-wave interaction phenomenom was observed in the case of closely spaced obstacles. Main emphasis has been placed on the half scale field experiments. In these, the maximum flame speed has been of the order of 100 m/s, resulting in positive peak pressures of $50\text{-}100.10^3$Pa in 5 - 10 m distance from

the source. The explosion process was found to be reasonable symmetric. The attenuation of the blast wave due to vegetation and the influence of obstacles as banks, walls and houses on the pressure field have been investigated. The presence of the bank and the house was felt in a zone with a length corresponding to a typical dimension of the obstacles, whereas the overall pressure field is shown to be unaffected by the type of obstacles and vegetation investigated. For the wall and house, reflection factors have been established, and some variation over the surface has been measured. The scatter of the pressure measurements is estimated for stable, neutral and unstable atmospheric conditions, and an attempt to determine the ground reflection factor has been performed. Finally the accelerations of a house exposed to the blast wave have been examined.

30510 **(EUR—9676-Vol.2) Gas explosion characterization, wave propagation (half-scale experiments). Vol. 2.** Larsen, G.C.; Roed, J.; Andersen, S.I. (Commission of the European Communities, Luxembourg). 1985. 165p. NTIS (US Sales Only), PC A08/MF A01. File Number DE86751647.

A number of experiments have been performed with blast waves arising from the ignition of homogeneous and well defined mixtures, oxygen and nitrogen, contained within spherical balloons with controlled initial dimensions. In the initial small scale experiments pressure characteristics, ground reflection phenomena and pressure distribution on box-like obstacles were studied. Both configurations with one box and two closely spaces boxes have been considered, and wave-wave interaction phenomenon was observed in the case of closely spaces obstacles. Main emphasis has been placed on the half-scale field experiments. In these, the maximum flame speed has been of the order of 100 m/s, resulting in positive peak pressures of 50-100.10^3 Pa in 5-10 m distance from the source. The presence of the bank and the house was felt in a zone with a length corresponding to a typical dimension of the obstacles, whereas the overall pressure field is shown to be unaffected by the type of obstacles and vegetation investigated. For the wall and house, reflection factors have been established, and some variation over the surface has been measured. The scatter of the pressure measurements is estimated for stable, neutral and unstable atmospheric conditions, and an attempt to determine the ground reflection factor has been performed. Finally the accelerations of a house exposed to the blast wave have been examined.

30511 **(LA-UR—85-2954) High explosive modeling in 2D Euler code for shaped charge problems.** Lee, W.H. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 7p. (CONF-860616—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE85017545.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

The object of this study is to incorporate a programmed burn model of high explosive into a two-dimensional, smeared shock Eulerian hydrodynamic code. Huygen's principle and Chapman-Jouguet theory are used in defining the detonation velocity and the location where the high-explosive energy is released. Precalculated burn information such as burn times, burn distances, burn intervals, and burn fractions are implemented into the code before the hydrodynamic actions take place. Two shaped charge problems are tested using the present code and the results are compared with the experimental data, as well as those from other codes. 9 refs., 9 figs.

30512 **(LA-UR—85-3375) Effects of physical properties on the initiation behaviors of heterogeneous high explosives.** Tang, P.K.; Forest, C.A.; Johnson, J.N.; Seitz, W.L. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 7p. (CONF-860616—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86000807.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

Results are presented of an investigation into the shock initiation of high explosives with respect to the effects of density and grain sizes. The investigators used a model of treating high-explosive reaction with a multistep process which includes the hot-spot excitation, decomposition, and the propagation of reaction into the region outside the hot spots. The roles of various parameters are discussed; in particular, the hot-spot mass fraction, the reference hot-spot temperature, and the temperature sensitivity parameter are cited as the key factors in the observed behaviors.

30513 **(LA-UR—85-3420) Simple blast model for structural design.** Neal, T.R. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 7p. (CONF-860616—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE86000802.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

Structures capable of either containing or surviving nearby detonating explosive are useful research tools for investigating properties of materials. Our particular interest is in spherical steel vessels that are only stressed elastically. Although there is a large amount of data describing blast waves in air, it is mostly for the farfield region $R > 1$ where R is the reduced radius - that is, the distance from the charge center divided by the cube root of the charge mass - expressed here in $m/kg^{1/3}$. Our region of investigation was the range $0.3 < R < 0.7$. For these distances the blast effect is mainly impulsive, and normally less than 1% of the explosive energy is coupled into kinetic energy of the vessel. The response of vessels to spherical charges of the HMX-based explosive PBX 9501 has been investigated both for vessels filled with ambient air and evacuated. A simple scaling model is used to correlate the data for various size vessels and to describe the impulse on structures. This model is then applied to one test of the TATB-based explosive PBX 9502. Finally, the immediate residual pressure in the vessels was measured to show the degree of short-term overpressure in evacuated structures. 1 ref., 2 figs., 3 tabs.

30514 **(LA-UR—85-3554) Radial buildup to detonation in pentaerythritol tetranitrate (PETN).** Dinegar, R.H. (Los Alamos National Lab., NM (USA)). Oct 1985. Contract W-7405-ENG-36. 9p. (CONF-860616—6). NTIS, PC A02/MF A01; GPO Dep. File Number DE86002383.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

Purified PETN was pressed to a density of 0.95 g/cc in Lucite cylinders of 2.54-cm diameter and 0.76-cm length. These charges were initiated by means of an exploding bridgewire located in the center of one face of the pressing. The firing capacitance and inductance were held constant. The energy delivered to the explosive charge was changed by varying the condenser voltage. The radial buildup to detonation was recorded by a rotating mirror camera with the slit perpendicular to the bridgewire. Results are discussed. The conclusion is that the deflagration to detonation development is not perfectly spherical from the initiation source but more ellipsoidal with the highest rate oriented along the charge length. 3 figs., 1 tab.

30515 **Production of the nitromethane aci ion by UV irradiation: its effect on detonation sensitivity.** Engelke, R.; Earl, W.L.; Rohlfing, C.M. (Los Alamos National Lab., NM). *Journal of Physical Chemistry;* 90: No. 4, 545-547(13 Feb 1986).

Earlier workers have shown that UV irradiation of liquid nitromethane increases this explosive's sensitivity to detonation. They thought that the increased sensitivity was caused by UV production of methyl nitrite. The UV detonation experiment has been reproduced and an increased sensitivity has been found. Under conditions similar to the detonation experiment, it is shown that UV irradiation produces the aci ion of nitromethane and no detectable amount of methyl nitrite; ^{13}C NMR was used to demonstrate this. This indicates that the sensitizing chemical species is the aci ion. Very small additions of organic base to liquid nitromethane also: (1) sensitive it to detonation and (2) produce the aci ion and only the aci ion. This work suggests that both means of detonation sensitization are due to the same cause - the presence of the aci ion. 14 references, 3 figures, 1 table.

30516 **Frequency shift measurement in shock-compressed materials.** Moore, D. S.; Schmidt, S. C. (to The United States of America as represented by the United States Department of Energy). US Patent 4,545,679. 8 Oct 1985. Filed date 21 Feb 1984. vp.

PAT-APPL-581934.

A method for determining molecular vibrational frequencies in shock-compressed transparent materials. A single laser beam pulse is directed into a sample material while the material is shock-compressed from a direction opposite that of the incident laser beam. A Stokes beam produced by stimulated Raman scattering is emitted back along the path of the incident laser beam, that is, in the opposite direction to that of the incident laser beam. The Stokes beam is separated from the incident beam and its frequency measured. The difference in frequency between the Stokes beam and the incident beam is representative of the characteristic frequency of the Raman active mode of the sample. Both the incident beam and the Stokes beam pass perpendicularly through the shock front advancing through the sample, thereby minimizing adverse effects of refraction.

4502 Nuclear

REFER ALSO TO CITATION(S) 30545, 30697

30517 **Simple ballistic-missile-defense model to help decision makers.** Hoyt, H.C. (Los Alamos National Lab., NM). *Interfaces;* **15**: No. 5, 54-62(Sep-Oct 1985).

A simple model which integrates the whole picture of ballistic missile defense (BMD) and identifies trade-offs that will dominate during system and component design can be useful as a general introduction to the subject as well as a tool for decision makers. Current BMD thinking focuses on a layered defense, a succession of independent systems that, working in sequence, reduce an enemy threat either to zero or to a small fraction of its initial strength. The basic task of a BMD system is to destroy a given number of missiles or re-entry vehicles within a specified time. The author outlines a model which reveals the advantages and disadvantages of different weapon types for each phase of an engagement against a given enemy threat. The model can also show how many weapons are needed, but other studies are needed to configure the detection and weapon systems in space or on the ground. 3 figures, 1 table.

4503 Explosion Detection

30518 **(UCID—20689) Discrimination of NTS explosions and western United States earthquakes: data processing.** Vergino, E.S.; Denny, M.D.; Taylor, S.R. (Lawrence Livermore National Lab., CA (USA)). Mar 1986. Contract W-7405-ENG-48. 30p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86009347.

Twelve regional seismic discriminants outlined in Pomeroy et al. (1982) have been applied to 330 NTS explosions and 130 western United States earthquakes. These discriminant use characteristics measured from the waveform data (seismograms). The characteristics or parameters were measured using automatic processing algorithms. In this report we will: (1) discuss the automatic processing of the explosions and earthquakes, and (2) show some examples of the problems encountered in such automatic processing. Results of the discrimination experiment will be presented in subsequent reports.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

REFER ALSO TO CITATION(S) 30541

30519 **(UCRL—94338) Design and use of zonally-averaged climate models.** MacCracken, M.C.; Ghan, S.J. (Lawrence Livermore National Lab., CA (USA)). Mar 1986. Contract W-7405-ENG-48. 46p. (CONF-860591—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008764.

From North Atlantic Treaty Organization advanced study institute on physically-based modeling and simulation of climate and climatic change; Erice, Sicily, Italy (11 May 1986).

Zonally-averaged climate models (ZACMs) provide a bridge from one-dimensional models such as energy-balance and radiative-convective models to three-dimensional general circulation models. Each type of model in this hierarchy involves particular simplifications, assumptions, and complexities in its development. As a consequence, each type of model presents particular advantages and disadvantages in investigation of questions of importance to better understanding of climate. While representation of the influence of horizontal eddies on the meridional climate structure presents special difficulties for a ZACM, the inclusion of latitudinal and altitudinal variations and the absence of synoptically-generated climatic variability permit the investigation of a range of climatic perturbations in which the forcing function is relatively small, latitudinally limited, or transient.

30520 **Summary report of the workshop on the interactions of climate and energy.** Knox, J.B.; Moses, H.; MacCracken, M.C. (Lawrence Livermore National Lab., CA). *Bulletin of the American Meteorological Society;* **66**: No. 2, 174-183(Feb 1985).

Primary discussion topics included current uses of climate data, the perceived impacts of climatic anomalies on the energy sector, ways to improve the uses of climate data, and recommendations for future research by the climate community. The workshop proceedings, which is being published by the Department of Energy, presents studies on the application of existing data to the diagnosis of the climatic component in energy supply and demand and the short-term prediction of regional scale energy requirements. Staff members of the National Oceanic and Atmospheric Administration's (NOAA) National Climate Data Center (NCDC) and Climate Analysis Center (CAC) review the currently available climate data and services. Four panel reports identify and enumerate the impacts of climate on each of the segments of the energy industry and offer recommendations for improvements, further research, and, in some cases, concepts for practical demonstrations of immediate potential value to the pertinent energy sector. 6 tables.

30521 **Wind direction meander at a coastal site during onshore flows.** Raynor, G.S.; Hayes, J.V. (Brookhaven National Lab., Upton, NY). *Journal of Climate and Applied Meteorology;* **23**: No. 6, 967-978(Jun 1984). Contract AC02-76CH00016.

About 700 cases of wind direction meander occurred in a three-year period during onshore flow at a Long Island coastal site. Most appeared to be caused by internal gravity waves but some by roll vortices. Each case was documented, with respect to date, time, wind speed, wind direction and stability, and described by duration, number of waves, angular amplitude and period. Hourly wind data for the same years were examined to determine the frequency of onshore flows. Most meander cases occurred in spring and summer, at low to moderate wind speeds and with stable conditions over the ocean. Duration varied from 4 to 438 min and averaged 94 min. The number of half-waves per case varied from 4 to 63 and averaged 10. Frequency varied from 0.3 to 30 with a mean of 4 waves per hour. Mean angular amplitude ranged from 4 to 68 and averaged 14°. Maximum amplitudes as large as 125° occurred. Results were compared to σ/sub y/ data from oil-fog smoke diffusion experiments. Calculations show that horizontal dispersion caused by a combination of meander and turbulent diffusion can be more than 30 times greater than that caused by diffusion alone and averaged 4 times greater. However, meander with angular amplitudes greater than 3° occurred only 15% of the time during onshore flow even though the air over the ocean was stable 59% of the time. Thus, the presence of significant meander cannot be assumed for diffusion calculations, although diffusion measurements indicate that minor meanders are frequent during stable conditions. 26 references, 15 figures, 1 table.

30522 **Plateau monsoons of the northern hemisphere: a comparison between North America and Tibet.** Tang, M.; Reiter, E.R. (Colorado State Univ., Fort Collins). *Monthly Weather Review;* **112**: No. 4, 617-637(Apr 1984). Contract AC02-76EV01340.

Detailed analyses are presented of the temperature and pressure fields of the planetary boundary layer (PBL) and their seasonal variability over the western US and over the Plateau of Tibet (Qinghai-Xizang Plateau). Over the US these analyses rely on 850 mb data, augmented by surface data. Over Tibet the 600 mb surface adequately describes the PBL. The effects of a plateau monsoon appear prominently during winter and summer over both plateaus. Together with continental monsoon effects they help to shape prominent circulation features, such as the low-level jet stream (LLJ) over Texas and Oklahoma. The complex, seasonal characteristics of precipitation regimes over the North American continent can be explained, to a large extent, by considering these monsoonal changes in the PBL, especially over the mountains. 37 references, 19 figures.

30523 **Lidar observations of mixed layer dynamics: tests of parameterized entrainment models of mixed layer growth rate.** Boers, R.; Eloranta, E.W.; Coulter, R.L. (Univ. of Wisconsin, Madison). *Journal of Climate and Applied Meteorology;* 23: No. 2, 247-266(Feb 1984).

Ground based lidar measurements of the atmospheric mixed layer depth, the entrainment zone depth and the wind speed and wind direction were used to test various parameterized entrainment models of mixed layer growth rate. Six case studies under clear air convective conditions over flat terrain in central Illinois are presented. It is shown that surface heating alone accounts for a major portion of the rise of the mixed layer on all days. A new set of entrainment model constants was determined which optimized height predictions for the dataset. Under convective conditions, the shape of the mixed layer height prediction curves closely resembled the observed shapes. Under conditions when significant wind shear was present, the shape of the height prediction curve departed from the data suggesting deficiencies in the parameterization of shear production. Development of small cumulus clouds on top of the layer is shown to affect mixed layer depths in the afternoon growth phase. 26 references, 26 figures, 2 tables.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 29187, 29193, 29194, 29195, 29198, 29201, 29214, 29279, 29280, 29281, 29282, 29685, 29686, 29687, 29688, 29689, 29690, 29691, 29693, 29695, 29696, 29697, 29701, 29702, 29703, 29706, 29707, 29709, 29710, 29711, 29712, 29713, 29714, 29715, 29716, 29717, 29718, 29719, 29720, 29721, 29722, 29723, 29724, 29728, 29729, 29730, 29731, 29732, 29733, 29735, 29736, 29737, 29738, 29739, 29740, 29741, 29742, 29744, 29905, 30181, 30207, 30256, 30406, 30572, 30578, 30704, 30711

30524 **(CONF-860163—1) Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States.** Lindberg, S.E. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 16p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86008540.

From Workshop on analysis of trace metals in rain; Toronto, Canada (29 Jan 1986).

Noncontaminating methods for collection and analysis of Cd, Mn, Pb, and Zn in rain were developed and applied to a study of metal deposition at four foreasted sites during the period 1976 to 1982. The metal concentrations measured in rain indicate that these sites are representative of rural, continental areas. The concentrations display both temporal and spatial trends, although the trends are complicated by the strong influence of rainfall amount which is inversely correlated with metal concentrations.

30525 **(CONF-860390—1) Estimates of long-term trends in sulfur deposition.** Shannon, J.D.; Lesht, B.M. (Argonne National Lab., IL (USA)). 1986. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86008000.

From Conference on acid rain: clouds over the Midwest - science and solutions; Chicago, IL, USA (7 Mar 1986).

Knowledge of the trends in the wet and dry deposition of acidifying pollutants principally oxides of sulfur (SO/sub x/) and nitrogen (NO/sub x/), over the last several decades across North America would be extremely valuable to researchers in the National Acid Precipitation Assessment Program (NAPAP). Unfortunately, a lengthy, unambiguous data set that would provide this record does not exist. The best long-term record is that collected at Hubbard Brook in New Hampshire (National Research Council, 1983), where observations have been made regularly since the middle 1960s. However, the Hubbard Brook deposition data are based upon sampling using bulk collectors that may confound wet deposition with an unknown fraction of the dry deposition. Monitoring networks that can directly measure dry deposition have yet to be established. For the period of time for which adequate networks of wet-only samplers exist (roughly since near the end of the last decade), regional and national emission changes have been too small (of the order of 10% or less) for any emission-related changes in the wet deposition field to be separated statistically from climatologically-induced variability. In this paper we use a numerical long-range atmospheric transport model both to estimate the trend in North American sulfur deposition for the period 1975-1981 and to examine the relative importance of climatology and emission changes to variations in deposition. 5 refs., 2 figs., 2 tabs.

30526 **(CONF-8506213—2) Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States.** Youngdahl, C.A.; Doe, B.R. (Argonne National Lab., IL (USA); Geological Survey, Reston, VA (USA)). Feb 1986. Contract W-31-109-ENG-38. 29p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008001.

From State-of-the-art symposium on degradation of materials due to acid rain; Arlington, VA, USA (17 Jun 1985).

Marble and limestone surfaces were exposed to atmospheric conditions at four eastern US sites and were monitored for changes in surface chemistry, surface roughness/recession, and weight. The effect of acid deposition, to which calcareous materials are especially sensitive, was of particular interest. Results are described for the first year of testing, and aspects of a preliminary equation to relate damage to environmental factors are discussed. Thus far, findings support that acid deposition substantially damages marble and limestone surfaces. Improvements in methods to reduce uncertainties in the quantitative contributions of important chemical species are outlined for the ongoing effort.

30527 **(ENEA-RT/STUDI—85-1) Assessing environmental effects of oil-fuelled energy systems.** Pinchera, G.C.; Bocola, W.; Cirillo, M.C.; Martinelli, M.; Triolo, L. (ENEA, Casaccia (Italy). Direzione Centrale Studi - Unita Valutazioni Ambientali e Socioeconomiche; ENEA, Casaccia (Italy). Dipartimento Fonti Alternative e Risparmio Energetico). 1984. 19p. (IAEA-SM—273/33; CONF-840422—4). NTIS (US Sales Only), PC A02/MF A01. File Number DE86900964.

From International symposium on risks and benefits of energy systems; Juelich, F.R. Germany (9 Apr 1984).

The principal objectives of the VESE Project are the assessment of the impact on the natural and man-made environment, on plants and animals, on human health and on works of art caused by various energy sources and the identification of possible measures of intervention, prevention and control. The paper presents some results of a study on the environmental and health impact of oil systems in the province of Piacenza, where three oil-fired power plants are located, together with industrial and civil installations using oil products as fuel. A critical survey of all information already available together with a specific field investigation has been performed in order to estimate the total consumption of fuel in 1981. The characterization of residuals has been limited to air pollutants. Sulphur oxides, nitrogen oxides and particulate matter have been considered. The inventory of the air pollutants has been made on the basis of the characteristics of the plants analyzed, of the fuel consumption and of the emission factors (estimated for the specific plants or reported in the literature). A multisource dispersion model (DIMULA) has been developed taking into account the meteorological peculiarity of the area. An application of this model to the dispersion of sulphur oxides in the northern part of the province is reported here. Using published data a regression analysis of alfalfa yield losses as a function of sulphur dioxide concentration has been carried out. A proposal for the systematic study of respiratory parameters in school children is presented and some weaknesses of cross-sectional epidemiological study are discussed. 20 refs., 5 figs., 3 tabs.

30528 (EPRI-CS—4404-Vol.1, pp 19.1-19.23) **Prediction of plume opacity from stationary sources.** Ensor, D.S.; Damle, A.S.; Lawless, P.A.; Sparks, L.E. (Research Triangle Institute, Research Triangle Park, NC). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The visual appearance of stack emissions (or plume opacity) is an effective regulatory tool. Therefore, it is important to provide ways of designing control equipment to meet plume opacity as well as mass emission limitations. Two general problems are of interest: opacity resulting from primary emissions of solid particles and opacity resulting from particles due to condensing materials. The key variable in both cases is the particle size distribution. For dry particles, the particle size distribution is shaped by the industrial process and the control device. Condensing plumes result from the nucleation of vaporous material onto primary particulate matter. The resulting plume opacity depends on the primary particle size distribution and the time/temperature history of the flue gas. 21 references, 8 figures, 7 tables.

30529 (EPRI-CS—4404-Vol.4, pp 2.1-2.15) **Pilot demonstration of air curtain control of buoyant fugitive emissions.** Duncan, M.W.; Yung, S.C.; Patterson, R.G.; Kuykendal, W.B.; Harmon, D.L. (Air Pollution Technology, Inc., San Diego, CA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Typical systems for controlling buoyant fugitive emissions involve hooding at the source, or total building enclosure and evacuation. A simpler and cheaper method is to divert the emissions with an air curtain (and fans for some cases) into a control device located near the source. Under sponsorship of the US EPA, Air Pollution Technology, Inc. is demonstrating the technical and economic feasibility of using an air curtain transport system for controlling particle emissions from mold pouring operations at a Naval foundry in San Diego, California. The system uses an air curtain to capture and convey the buoyant fugitive emissions to a filter unit. High efficiency Particulate Air (HEPA) filters in the filter unit collect the particles. The system is currently being tested, and early results indicate that the air curtain capture efficiency is 91 to 100%. 1 reference, 5 figures, 1 table.

30530 (EPRI-CS—4404-Vol.4, pp 3.1-3.14) **Characterization of fugitive particulate emissions from industrial sites.** Basden, L.S. (Univ. of New South Wales, Kensington, Australia). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

One of the problems of modeling fugitive particulate matter emissions from various industrial sites, such as quarries or open cut coal mines, coal loaders, ore transport lines or stockpiles, etc., is to obtain reliable source emission data. If such data are available there are numerous dispersion equations, or models and programs based thereon, which may be used to predict airborne concentrations or ground deposition rates around the sites as functions of appropriate meteorological parameters. This paper reviews briefly some recently completed work on this subject in which conventional instruments such as hi-vol samplers and deposition gauges have been used. However, the principal objective is to describe current work involving a small portable cascade impactor and related portable manually-operated instruments to determine the nature and emission rates from component sections of the sites, as opposed to the overall average values obtained with long sampling period instrument. 16 references, 4 figures, 2 tables.

30531 (EPRI-CS—4404-Vol.4, pp 4.1-4.11) **Evaluation of an air curtain secondary hooding system.** Burckle, J.O. (Industrial Environmental Research Lab., Cincinnati, OH). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

A prototype secondary hooding system, based upon air curtain technology, has been installed in a domestic primary copper smelter to capture fugitive emissions from the converter. Tests have been conducted by the USEPA to evaluate its effectiveness for capture of low-level fugitive particulates, including trace metals, and sulfur dioxide. These tests demonstrated that this system was capable of providing effective control of emissions during most of the converter cycle, achieving an overall capture effectiveness of 94%. The Office of Air Quality Planning and Standards has proposed the air curtain secondary hooding system as Best Available Control Technology for converter fugitive emissions. 6 figures, 6 tables.

30532 (EPRI-CS—4404-Vol.4, pp 5.1-5.15) **Technical manual on the identification, assessment, and control of fugitive emissions.** Cowherd, C. Jr.; Kinsey, J.S.; Kuykendal, W.B. (Midwest Research Institute, Kansas City, MO). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

To assist control agency personnel and industry personnel in evaluating fugitive emission control plans and in developing cost-effective control strategies, the US Environmental Protection Agency is funding the preparation of a technical manual on the identification, assessment, and control of fugitive particulate emissions. This paper summarizes the organizational structure and content of the technical manual. The organizational structure follows the steps to be undertaken in developing a cost-effective control strategy for fugitive particulate emissions. The procedural steps are the same whether the sources of interest are contained within a specific industrial facility or distributed over an air quality control jurisdiction. In line with the results of a survey of 84 potential industrial and regulatory users, the manual will emphasize open dust sources (rather than process sources) and preventive control systems (rather than emission capture/removal systems). This paper also summarizes the quality and extent of published performance data for control systems applicable to open dust sources and process sources. The scheme developed to rate performance data reflects the extent to which a control efficiency value is based on mass emission measurement and reported in enough detail for adequate validation. 5 references, 2 figures, 1 table.

30533 (EPRI-CS—4404-Vol.4, pp 6.1-6.12) **Quantification of roadway fugitive dust at a large Midwestern steel mill.** Rosbury, K.D.; Kemner, W. (PEDCo Environmental Inc., Golden, CO). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The purpose of this research was to quantify roadway emissions in a major Midwestern steel mill that has over 80 miles of roads within its boundaries. The research took place in two phases. First, a field survey consisting of 515 vehicle counts and 165 roadway silt/surface loading samples was completed. Also, all regular vehicle movements (e.g., transport of tar from the coke plant to the blast furnace, hot roll shipments) were identified by origin, destination, trip path, and vehicle type. These 200 movements were each quantifiably related to a scaling parameter of plant production (e.g., coke production, sinter production) reported in the plant's Daily Report of Operation. The second phase consisted of the design and application of a computer program that assigned the 200 regulator vehicle movements for the plant road system. The computer-assigned vehicle trips were calibrated against the 515 vehicle counts taken during the field survey. After calibration, the computer output for each roadway section (approximately 300) listed plant area, road classification, measured silt and surface loading, length, calculated vehicle miles traveled/shift by vehicle type, calculated average emission rate, and calculated emission/shift. When plant operations change, as reflected in the Daily Report of Operations, all vehicle miles traveled and emission data can be adjusted accordingly. 3 references, 1 figure, 1 table.

30534 (EPRI-CS—4404-Vol.4, pp 7.1-7.10) **Evaluation of street sweeping as a means of controlling urban particulate.** Hewitt, T.R. (CRS Sirrine, Inc., Research Triangle Park, NC). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Street sweeping using a vacuum street sweeper was found to be a highly effective method of reducing particulate concentrations in two northern US urban locations. The effectiveness of street sweeping was measured by determining the percentage reductions in monitored TSP concentrations. Reductions measured at one location were used to predict reductions at a second location where sweeping was being considered. Monitoring results during the first year of sweeping at the second location showed that sweeping achieved greater reductions than predicted. Average annual TSP concentrations were reduced 15-38% at the two locations. 5 figures, 1 table.

30535 (EPRI-CS—4404-Vol.4, pp 8.1-8.17) **Windbreak effectiveness for the control of fugitive-dust emissions from storage piles - a wind tunnel study.** Billman, B.J. (North Carolina State Univ., Raleigh, NC). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Results of wind-tunnel experiments to determine the optimal windbreak porosity, size, and location for storage-pile fugitive-dust emission control are presented. A neutrally stratified, rural atmospheric boundary layer was simulated in the wind tunnel. A cone made of non-erodible material was used to represent an idealized storage pile shape. Straight sections of windbreak material of various combinations of porosity, height, length, and location were placed upwind of the pile. Wind speeds near the pile surface at various locations were measured with thermistors. Wind speed was isolated here as the primary factor affecting particle uptake. The surface averaged wind speed reduction and a windbreak effectiveness factor based on the relationship between the cube of the wind speed and particle uptake are given for each windbreak. All windbreaks used caused wind speed reductions. The largest and most solid windbreak caused the greatest reduction, but similar wind speed reductions were given by several smaller windbreaks. A 50% porous windbreak of height equal to the pile height and length equal to the pile diameter at the base, located one pile height from the base was found to be quite effective in reducing wind speeds over the entire pile surface. Windbreak effectiveness decreased as the angle between the windbreak and the wind direction decreased. 21 references, 10 figures, 3 tables.

30536 (EUR—9536) **Application of the methods of statistical analysis of pseudo-random signals to the interpretation of fields trials on the atmospheric transport of active products and to estimate of confidence limits.** Olivari, D. (Commission of the European Communities, Luxembourg). 1984. 137p. NTIS (US Sales Only), PC A07/MF A01. File Number DE86751638.

An attempt is made at identifying the most important factors which introduce difficulties in the analysis of results from tests on pollutant dispersal: the unsteadiness of the phenomenon, the effect of external uncontrollable parameters, and the inherent complexity of the problem itself. The basic models for prediction of dispersion of passive contaminants are discussed, and in particular a Lagrangian approach which seems to provide accurate results. For the analysis of results many problems arise. First the need of computing for the results the statistical quantities which describe them: the mean, the variance and higher order moments are important. It is shown that there is no easy solution if the duration and/or the number of independent "events" to be analyzed are too limited. The probability density function provides the most useful information, but is not easy to measure. A family of functions is recalled which predict reasonably well the trend of the pdf. Then the role of intermittency is shown in some detail. Its importance cannot be underestimated and its relationship to pdf and the effects on measurements are shown to be rather complex. Finally, an example is made to show the effects of the variance of external factors. 42 figs., 56 refs.

30537 (LBL—20654) **Size fractionation of black and organic particulate carbon from fires. Final report.** Dod, R.L.; Mowrer, F.; Gundel, L.A.; Williamson, R.B.; Novakov, T. (Lawrence Berkeley Lab., CA (USA)). Nov 1985. Contract AC03-76SF00098. 28p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009223.

Emission factors to total smoke particulates as well as organic and black carbon have been measured as a function of size for a set of building materials typical of those used in urban construction. Black carbon emissions (mass per fuel mass) were similar among the wood fuels studied, although the dominant form of combustion varied from flaming to smoldering. Black carbon was found predominantly in the finest size ranges ($\leqq$ 0.20 μm). Polyurethane foam produced a greater emission of black carbon, and the particle size distribution of that carbon extended to much larger aerodynamic diameters than did those of the wood samples. For the fuels tested, total smoke particle emissions ranged from 0.3 to 2.3 percent of fuel mass; black carbon emissions were 0.03 to 0.3 percent of fuel mass.

30538 (N—86-16748) **Airborne Lidar measurements of aerosols, mixed layer heights, and ozone during the 1980 PEPE/NEROS summer field experiment.** Browell, E.V.; Shipley, S.T.; Butler, C.F.; Ismail, S. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Dec 1985. 197p. (NASA-RP—1143; L—15943). NTIS, PC A09/MF A01.

A detailed summary of the NASA Ultraviolet Differential Absorption Lidar (UV DIAL) data obtained during the EPA Persistent Elevated Pollution Episode/Northeast Regional Oxidant Study (PEPE/NEROS) Summer Field Experiment Program (July through August 1980) is presented. The UV dial data set consists of remote measurements of mixed layer heights, aerosol backscatter cross sections, and sequential ozone profiles taken during 14 long-range flights onboard the NASA Wallops Flight Center Electra aircraft. These data are presented in graphic and tabular form, and they have been submitted to the PEPE/NEROS data archive on digital magnetic tape. The derivation of mixing heights and ozone profiles from UV Dial signals is discussed, and detailed intercomparisons with measurements obtained by in situ sensors are presented.

30539 (N—86-16784) **Measurements of neutral constituents using far infrared remote sensing techniques.** Carli, B.; Harries, J.E. (Consiglio Nazionale delle Ricerche, Florence (Italy). Lab. di Elettronica Quantistica). Jun 1985. 19p. NTIS, PC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801.

Since 1977 much progress has occured both in the direction of improvements in experimental measurement from balloons and in the area of theoretical studies of the far infrared spectrum. Recent experimental results of balloon measurements are discussed as is theoretical calculations and spectroscopic data of the far infrared spectrum. A dictorial representation of the far infrared spectrum of a selection of stratospheric constituents is presented and analyzed.

30540 (N—86-16796) **Present state of knowledge of the upper atmosphere: an assessment report.** (National Aeronautics and Space Administration, Washington, DC (USA)). Jan 1984. 73p. (NASA-TM—87559). NTIS, PC A04/MF A01.

A program of research, technology, and monitoring of the phenomena of the upper atmosphere, to provide for an understanding of and to maintain the chemical and physical integrity of the Earth's upper atmosphere was developed. NASA implemented a long-range upper atmospheric science program aimed at developing an organized, solid body of knowledge of upper atmospheric processes while providing, in the near term, assessments of potential effects of human activities on the atmosphere. The effects of chlorofluorocarbon (CFC) releases on stratospheric ozone were reported. Issues relating the current understanding of ozone predictions and

trends and highlights recent and future anticipated developments that will improve our understanding of the system are summarized.

30541 **(NP—6751712) Ozone measurements near the ground and in the atmosphere in the first half-year 1985.** (Deutscher Wetterdienst, Hohenspeissenberg (Germany, F.R.). Meteorologisches Observatorium). 1985. 194p. (In German and English). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751712.

Tables are presented on surface ozone, total ozone, ozonograms, results of radioprobe measurements and monthly and daily variations of ozone and temperature in km steps. (HP).

30542 **(NP—6751723) Ecological benefits of natural gas. A choice of illustrative papers.** (Arbeitsgemeinschaft fuer Sparsamen und Umweltfreundlichen Energieverbrauch e.V. (ASUE), Frankfurt am Main (Germany, F.R.)). 1985. 81p. (In German). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751723.

The publication abstracted contains a choice of illustrative papers informing the reader on the general principles of combustion processes with solid, liquid and gaseous fuels, on substantial pollutants, hazardous environmental effects due to air pollution, on emissions and immissions, the diffusion, conversion and effects of pollutants, on possible measures of emission minimization, legal aspects and comparative evaluations of heating systems. Apart from mentioning the sources used, the annex contains a comprehensive collection of diagrams and tables. (DG).

30543 (NUREG/CR—4158, pp III.1-III.19) **Modeling turbulent exchange in forest canopies.** Lewellen, W.S. (Aeronautical Research Associates of Princeton, Inc., NJ). Apr 1985. NTIS, PC A04/MF A01 - GPO $4.50. File Number TI85901272.

In Compilation of information of uncertainties involved in deposition modeling.

A review of the problems associated with modeling the interaction between the atmosphere and a forest is given. Emphasis is placed on the need for ensemble averaging as well as temporal and spatial averaging. Specific recommendations are given for models for the mass, momentum, and energy interaction resistances. It is argued that experimental measurements should be averaged over time periods which are long in comparison to the product of the canopy height times the canopy resistance. 21 references, 5 figures, 1 table.

30544 **(SRD-R—325) Factors influencing pool fires on porous ground.** Webber, D.M. (UKAEA Safety and Reliability Directorate, Culcheth). Feb 1985. 61p. United Kingdom Atomic Energy Authority, Wigshaw Lane, Culcheth, Warrington WA3 4NE England. File Number TI86901196.

In previous studies of pool fires, very little attention has been paid to how the nature of the ground may affect the fire. An accidental spill of a flammable liquid is likely, however, to be on some form of porous terrain, such as soil, sand, gravel, or railway ballast. This work constitutes an initial, theoretical study of the possible differences between spills on smooth, impermeable ground and spills on porous terrain. Flow of the liquid in the absence of burning is considered. Porous terrain may hinder the lateral flow of liquid keeping the bulk of the liquid together for longer than if it were simply to flow away over smooth ground. However, if the porous terrain is deep enough, some liquid may escape by seeping downwards. The effect on hazards via this flow prior to ignition is thus dependent on the nature of the porous ground. After ignition of a spill on porous ground, the ground may act to shield the fuel from the radiation from the fire; heat must be conducted down through the ground to the fuel. The regression rate of the liquid fuel is therefore likely to be lower. A simple model suggests that this will result in a flame which is not so high as one over an exposed pool. There is no indication that the temperature of the flame is strongly affected by the nature of the ground. Thus hazards away from fire should be mitigated, but hazards within the flame may be aggravated, as the fuel may burn for a longer time. There is some evidence, however, that if the fuel is deeper than a few centimeters below the ground surface, then the fire will not be able to sustain itself. Cryogenic liquids spilled onto porous ground will vaporize faster, owing to the increased surface area for conduction, and to penetration of the ground by the liquid. It is concluded that the hazard depends on the nature of the fuel and the ground in a very complicated way.

30545 **(UCRL—94226) Progress in developing the smoke source term for "nuclear winter" studies: major uncertainties.** Penner, J.E. (Lawrence Livermore National Lab., CA (USA)). Mar 1986. Contract W-7405-ENG-48. 24p. (CONF-860280—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008021.

From Defense Nuclear Agency program technical review; Moffett Field, CA, USA (25 Feb 1986).

The potential effects on climate of large amounts of smoke injected into the atmosphere following a major nuclear exchange have been widely analyzed (Crutzen and Birks, 1982; Turco et al., 1983, NRC, 1985; Pittock et al., 1986). Although simplifications and uncertainties still exist in the application of climate models to calculate the effects of smoke, many of the simplications that were necessarily made in the first studies have now been corrected. These improved climate models have shown that the effects of smoke on climate depend on the quantity and optical properties of the smoke that is generated and dispersed into the global atmosphere. The smoke amount and its optical properties can be summarized by the average optical depth that would result if the smoke were dispersed throughout half the northern hemisphere. In this paper a range of values for this average optical depth is determined, consistent with recent analyses. Different estimates for each of a variety of contributing factors give rise to a wide range of average optical depths, encompassing values that imply comparatively minor effects on climate to values that imply massive effects. Suggestions for further research that might narrow the range of possibilities are made.

30546 **Atmospheric gas and particle measurements at a rural northeastern US site.** Lewin, E.E.; de Pena, R.G.; Shimshock, J.P. (Pennsylvania State Univ., University Park). *Atmospheric Environment;* **20**: No. 1, 59-70(1986). Contract AS05-83OR21356.

Ammonia, nitric acid, sulfur dioxide and particles in two size ranges were collected at a rural site in northeastern US in January-March 1984. Ammonia was collected with an oxalic acid coated denuder, all other components were collected on filters. The concentrations of ammonia ranged between 0.0 and 0.5 ppbv, nitric acid: 0.1 and 2.3 ppbv and sulfur dioxide: 1 and 52 ppbv. Ammonium and sulfate in the fine particles were highly correlated, the regression line indicated that the most abundant compound was ammonium sulfate. The content of free hydronium ions in the fine particles was well below the ammonium content. No correlation between NH_3 and NH_4^+, HNO_3 and NO_3^- or SO_2 and SO_4^{2-} could be observed.

30547 **Aircraft and ground measurements of ammonia in Kentucky.** Alkezweeny, A.J.; Laws, G.L.; Jones, W. (Pacific Northwest Lab., Richland, WA). *Atmospheric Environment;* **20**: No. 2, 357-360(1986).

During the summer of 1983, ammonia concentrations were measured at the surface and aloft near Lexington, Kentucky. The results show wide daily variations. At the surface, ammonia concentrations ranged from 0.04 to 5.6 $\mu g\ m^{-3}$. Concentrations at night were much higher than those observed during the day. The concentrations aloft were lower than those measured concurrently at the surface. In most cases ammonia concentrations decreased with increasing altitude.

30548 **Determination of cobalt in samples containing cobalt and tungsten carbide by electrothermal atomic absorption spectrometry.** Firriolo, J.M.; Kutzman, R.S. (Brookhaven National Lab., Upton, NY). *American Industrial Hygiene Association Journal;* **46**: No. 9, 476-480(Sep 1985). Contract AC02-76CH00016.

A method has been developed to determine the amount of cobalt (Co) in atmospheric dust samples which include free and sintered Co. Cobalt and tungsten carbide (WC) mixtures ranging from 0-100% Co were prepared for atomic absorption analysis by dissolving the Co in aqua regia. Using this method, the amount of Co

in the samples assayed ranged from 90.9-100.1% of that gravimetrically added to the mixtures. The results of this aqua regia dissolution procedure for Co were compared to a hydrofluoric acid method which solubilized both the Co and the WC. Application of the aqua regia dissolution method to samples of sintered WC and Co dust resulted in complete recovery of the Co from these materials. These results were supported by x-ray analysis of the samples before and after dissolution of the Co with aqua regia. The described procedure is advantageous because it avoids the use of highly-caustic hydrofluoric acid and the results are quickly available.

30549 **Method of using a nuclear magnetic resonance spectroscopy standard.** Spicer, L. D.; Bennet, D. W.; Davis, J. F. (to The United States of America as represented by the Department of Energy). US Patent 4,529,710. 16 Jul 1985. Filed date 9 May 1983. vp.

PAT-APPL-492926.

$(CH_3)_3SiNSO$ is produced by the reaction of $((CH_3)_3Si)_2NH$ with SO_2. Also produced in the reaction are $((CH_3)_3SI)_2O$ and a new solid compound (NH_4) $((CH_3)_3SiOSO_2)$. Both $(CH_3)_3SiNSO$ and (NH_4) $((CH_3)_3SiOSO_2)$ have fluorescent properties. The reaction of the subject invention is used in a method of measuring the concentration of SO_2 pollutants in gases. By the method, a sample of gas is bubbled through a solution of $((CH_3)_3Si)_2NH$, whereby any SO_2 present in the gas will react to produce the two fluorescent products. The measured fluorescence of these products can then be used to calculate the concentration of SO_2 in the original gas sample. The solid product $(NH_4)((CH_3)_3SiOSO_2)$ may be used as a standard in solid state NMR spectroscopy, wherein the resonance peaks of either ^1H, ^{13}C, ^{15}N, or ^{29}Si may be used as a reference.

30550 **A case study of the effects of local and distant sources of alkaline material on precipitation in the midwest and plains.** Doty, K.G.; Semonin, R.G. (Illinois Dept. of Energy and Natural Resources, Champaign, IL). *Proceedings, Annual Meeting, Air Pollution Control Association;* **2**: 21(1984). (CONF-840612—). Contract AC02-76EV01199.

From Air Pollution Control Association annual meeting; San Francisco, CA, USA (25 Jun 1984).

The hypothesis of soil particulates being transported from source regions and raising the ph of precipitation over a large area in and away from these regions led to the idea of checking for such phenomena in the more current nadp network data. This was especially true for the period from the fall of 1980 through the spring of 1981, when widespread moderate to severe drought occurred throughout many parts of the country, including the Great Plains, Southeast and East. A part of a more extensive study, the NADP samplying week of March 31-April 7, 1981 was chosen for study. Dry surface conditions in parts of the Midwest and Plains and a significant dust storm on April 3 over portions of Southern Plains provided an opportunity to study the hypothesis of crustal enhancement of basic elements in precipitation.

30551 **Forecasting future industrial SO_2 and NO/sub x/ emissions.** Graves, K.; Pechan, E.; Turner, D.; Briggs, B. (E.H. Pechan and Associates, Inc., Springfield, VA). *Proceedings, Annual Meeting, Air Pollution Control Association;* **2**: 16(1984). (CONF-840612—).

From Air Pollution Control Association annual meeting; San Francisco, CA, USA (25 Jun 1984).

This paper presents estimates of future emissions from various economic source sectors with a focus on those emissions associated with industrial activities. These estimates were obtained from the environmental trends analysis model (ETAM), a simplified projection model developed by E.H. Pechan & Associates, Inc., under the sponsorship of the U.S. Department of Energy (DOE). These projections are based on energy and economic projections made by DOE and on data inputs from other sources and models. In this paper the authors present an overview of sulfur dioxide (SO_2) and nitrogen oxide (NO/sub x/) emission trends to the year 2010 from the industrial sector within the context of total anthropogenic emissions.

30552 **Urban and local source effects on precipitation chemistry.** Lipfert, F.W.; Dupuis, L.R. (Brookhaven National Lab., Upton, NY). *Proceedings, Annual Meeting, Air Pollution Control Association;* **2**: 21(1984). (CONF-840612—). Contract AC02-76CH00016.

From Air Pollution Control Association annual meeting; San Francisco, CA, USA (25 Jun 1984).

In this paper, precipitation chemistry measurements from the literature, and in some cases, from personal communications, are summarized and compared to examine the effects of local, urban and point sources on the patterns of ion concentrations in wet deposition. Care has been taken to assess the sampling and analysis methods insofar as possible, and to make comparisons on appropriate bases. The findings are intended to serve as preliminary estimation algorithms for urban precipitation chemistry, and to support the need for additional monitoring and research. In all cases where possible, the differential effects of urban and local sources have been referenced to emission strengths, and/or air quality as determined from published data for the time period in question. The hypothesis to be evaluated is that any excess urban or local wet deposition will be proportional to local air quality.

30553 **Statistical analysis of relationships between precipitation chemistry and air quality in New Hampshire and precursor emissions.** Lipfert, F.W.; Kaplan, E.; Daum, M. (Brookhaven National Lab., Upton, NY). *Proceedings, Annual Meeting, Air Pollution Control Association;* **2**: 31(1984). (CONF-840612—). Contract AC02-76CH00016.

From Air Pollution Control Association annual meeting; San Francisco, CA, USA (25 Jun 1984).

The paper briefly describes the data sets analyzed and the statistical techniques used, including quality control checks and corrections and adjustments made to the data. Temporal trends are analyzed on a bivariate basis, but the main findings of the paper are derived from multiple regressions which are intended to account for potentially confounding effects of weather variables and sampling frequency. These results are part of an ongoing project in trend analysis which will draw on precipitation chemistry data from other locations in an attempt to confirm the findings.

30554 **Quantitative standard for exposure chamber integrity.** Mokler, B.V.; White, R.K. (Lovelace Biomedical and Environmental Research Institute, Albuquerque, NM). *American Industrial Hygiene Association Journal;* **44**: No. 4, 292-295(Apr 1983). Contract AC04-76EV01013.

An inhalation exposure chamber separates the internal exposure atmosphere from the surrounding laboratory atmosphere. The integrity of this separation is reduced if the chamber leaks. A simple method for determining the physical integrity of inhalation exposure chambers is proposed and explained. Results obtained with this method are presented and integrity standards for both new and in-use chambers are suggested. 3 references, 4 figures, 1 table.

30555 **Relative humidity: important modifier of pollutant uptake by plants.** McLaughlin, S.B.; Taylor, G.E. (Oak Ridge National Lab., TN). *Science (Washington, D.C.);* **211**: 167-169(9 Jan 1981). Contract W-7405-ENG-26.

Laboratory measurements of foliar uptake of sulfur dioxide and ozone by red kidney beans demonstrated a strong effect of relative humidity on internal pollutant dose. Foliar uptake was enhanced two- to threefold for sulfur dioxide and three- to fourfold for ozone by an increase in relative humidity from 35 to 75 percent. For the same exposure concentration, vegetation growing in humid areas (such as the eastern United States) may experience a significantly greater internal flux of pollutants than that in more arid regions. 22 references, 1 figure, 1 table.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 29435, 29437, 29438, 29439, 30431, 30432, 30536

30556 (EPA—520/5-83/021, pp 201-208) **Some measurements of the equilibrium factor for radon daughters in houses.** Toohey, R.E.; Essling, M.A.; Wang, H.; Rundo, J. (Argonne National Lab., IL). Sep 1983. NTIS. Contract W-31-109-ENG-38.

In International meeting on radon-radon progeny measurements: proceedings.

The first step in such a program is to measure the equilibrium factor in a number of houses under a variety of conditions, by simultaneously measuring both the radon concentration and the working level. Our preliminary measurements in a few houses indicate that the equilibrium factor normally varies over a range of 0.05 to 0.50, but on occasions it approaches 1.0. The mean of eight sets of observations was 0.20 +- 0.14 (one std. dev.). Some of the parameters which have been observed to affect the equilibrium factor include the relative areas of room surfaces and airborne particles, the ventilation rate, and the air circulation. Human activities, such as cooking and smoking, also affect the equilibrium factor, by directly affecting the aforementioned variables. 2 references, 7 figures, 1 table.

30557 (EPRI-CS—4404-Vol.4, pp 9.1-9.18) **Evaluation of chemical stabilizers and windscreens for wind erosion control of uranium mill tailings.** Elmore, M.R.; Hartley, J.N. (Pacific Northwest Lab., Richland, WA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920159. (CONF-840859—Vol.4). Contract AC06-76RL01830.

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

Potential wind erosion of uranium mill tailings is a concern for the surface disposal of tailings at uranium mills. Wind-blown tailings may subsequently be redeposited on areas outside the impoundment. Pacific Northwest Laboratory (PNL) is investigating techniques for fugitive dust control at uranium mill tailing piles. Laboratory tests, including wind tunnel studies, were conducted to evaluate the relative effectiveness of 43 chemical stabilizers. Seventeen of the more promising stabilizers were applied to test plots on a uranium tailings pile at the American Nuclear Corporation-Gas Hills Project mill site in central Wyoming. The durabilities of these materials under actual site conditions were evaluated over time. In addition, field testing of commercially available windscreens was conducted. Test panels were constructed of eight different materials at the Wyoming test site to compare their durability. A second test site was established near PNL to evaluate the effectiveness of windscreens at reducing wind velocity, and thereby reduce the potential for wind erosion of mill tailings. Results of the laboratory and field tests of the chemical stabilizers and windscreens are presented, along with costs versus effectiveness of these techniques for control of wind erosion at mill tailings piles. 12 references, 4 figures, 6 tables.

30558 (EUR—9673-Vol.2) **Local scale atmospheric diffusion at a coastal site in the presence of breeze effects (Phase I and II: data collection at a coastal site and off shore). Vol. 2.** Cagnetti, P.; Ferrara, V.; Pellegrini, A. (Commission of the European Communities, Luxembourg). 1985. 853p. NTIS (US Sales Only), PC A99/MF A01. File Number DE86780449.

The aim of this contract is the characterization, from the thermal and anemological point of view of the lower layers of the atmosphere at a coastal site, affected by breeze circulation. Data are utilized to set up diffusion models for accidental releases of airborne materials, both of short and prolonged duration. Five inland meteorological campaigns, starting from January 82 (January, April, July, October 1982, January 1983), have been carried out; an appropriate extension of the contract allowed the execution of two more campaigns in the open sea (April, July 1983), utilizing the oceanographic ship "Bannock" kindly supplied by CNR. The analysis of the data showed the development of a well defined IBL during on-shore flow only in spring and summer, while an inversion layer was detectable aloft independently of the season (provided that an anticyclonic situation was present). According to those relevant features a simple diffusion model has been developed for short duration releases at local scale. Finally, the analysis and elaboration of the data, collected on site by a meteorological automatic station, allowed the extension of the model to prolonged releases.

30559 (EUR—9925) **Assessment of the dispersion of fission products in the atmosphere following a reactor accident under meteorological conditions of low wind speeds with or without high temporal and spatial variability in wind speed and direction.** Crabol, B.; Deville-Cavelin, G. (Commission of the European Communities, Luxembourg). 1985. 119p. NTIS (US Sales Only), PC A06/MF A01. File Number DE86780450.

This study of atmospheric dispersion at low wind speed include tracer experiments (SF_6, CEA-CADARACHE site) and interpretation with the tri-Gaussian puff computer code ICAIRE 3 of CEA/IPSN. Interesting characteristic features of low wind speed under stable condition were obtained. Slow temporal evolution of concentration in the field was observed with high concentration values along time after release end. Interpretation of experimental results with the computer code, using certain standard deviations, shows reasonable agreement on maximum concentration values. However, the observed plume is narrower than calculated, and a better fit was obtained modifying the standard-deviations, especially reducing the transversal one. This effect is probably linked to site topography. Many observed differences between calculated and measured values are due to difficulty in evaluating the transport terms (wind speed and direction). Their punctual measurement gives a poor representation of mean pollutant transport, probably because of heterogeneity of wind field, at Cadarache, in low wind speed situations.

30560 (FRNC-TH—2216) **Contribution to the study of radioactive and heavy jets discharged in the presence of a cross-stream.** Badre, A. (Grenoble-1 Univ., 38 - La Tronche (France); Institut National Polytechnique, 38 - Grenoble (France)). 1981. 219p. (In French). NTIS (US Sales Only), PC A10/MF A01. File Number DE86751372.

A mathematical model is presented for the prediction of spreading and rising of radioactive and heavy jets discharged into a flowing ambient fluid. The model is based on the differential equations for the conversion of mass, momentum, concentration and thermal energy. The model has been tested by comparing the results with experimental data concerning atmospheric dispersion of gaseous effluents.

30561 (NUREG/CR—4158, pp I.1-I.12) **Dry deposition model sensitivity.** Lewellan, W.S.; Varma, A.K.; Sheng, Y.P. (Aeronautical Research Associates of Princeton, Inc., NJ). Apr 1985. NTIS, PC A04/MF A01 - GPO $4.50. File Number TI85901272.

In Compilation of information of uncertainties involved in deposition modeling.

An attempt is made to bound the uncertainty which is likely to exist in current models of plume depletion due to dry deposition. The particular application considered is a plume generated by a nuclear power plant accident. The analysis builds upon the study by Lewellen and Sheng of the fundamental turbulent interactions within a plant canopy. Initially, present understanding of the basic dependence of deposition velocity on a number of independent variables is reviewed. If the effluent of interest is in the form of small particles, the viscous sublayer on the canopy surface is likely to be the dominant factor in determining the deposition. Deposition velocity is estimated for some of the effluents which may be expected from a nuclear reactor accident. Uncertainties in the independent variables are translated into uncertainties in the deposition velocity. 3 figures, 1 table.

30562 (NUREG/CR—4158, pp II.1-II.37) **Evaluation of the expected uncertainty in precipitation scavenging rates for effluents resulting from a nuclear reactor accident.** Varma, A.K.; Lewellen, W.S. Apr 1985. NTIS, PC A04/MF A01 - GPO $4.50. File Number TI85901272.

In Compilation of information of uncertainties involved in deposition modeling.

The basic physics of precipitation scavenging is reviewed. Judgments are presented as to how definitive the available observational data are for determining the necessary empirical relationships. Major uncertainties are involved both as a result of the natural variability of the atmospheric precipitation process and our incomplete understanding of the underlying process. 34 references, 1 figure, 1 table.

5004 Thermal Effluents Monitoring And Transport

REFER ALSO TO CITATION(S) 30560

30563 **(SRD-R—297) Thermal radiation hazard ranges from large hydrocarbon pool fires.** Considine, M. (UKAEA Safety and Reliability Directorate, Culcheth). Oct 1984. 71p. United Kingdom Atomic Energy Authority, Wigshaw Lane, Culcheth, Warrington WA3 4NE England £7.00. File Number TI86901199.

This report reviews methods for determining hazard ranges from large hydrocarbon pool fires. Properties of the thermal radiation source are discussed in terms of flame size and shape (flame cross-section, flame height, the effects of flame merging for multiple fires and wind blown flames) and emissive power (flame temperature, emissivity and the effect of smoke on thermal radiation output). The transmission of radiation to a target is discussed in terms of the geometrical relationship between emitter and receiver and the transmissivity of the intervening atmosphere. It has been found that the use of a model assuming a cylindrical flame radiating continuously with a flux given by the Stefan-Boltzmann relationship and neglecting atmospheric absorption effects or shielding by objects can lead to gross overpredictions of hazard ranges for large hydrocarbon fires. A simple model, taking into account these ameliorating factors, is suggested here. The model is applied to a range of fire sizes and graphs of both target flux versus distance and thermal radiation hazard ranges are presented as a function of fire diameters in the range 20 to 1000 m. It is found that the use of this model can lead to the reduction of assessed hazard ranges, determined using the continuously radiating cylinder model with atmospheric transmissivity equal to unity, by more than a factor of 2, and that taking account of obstructions such as might be presented by a row of houses can lead to reduction factors greater than 4.

5006 Regulations

REFER ALSO TO CITATION(S) 29229, 29331, 29692, 29704, 29734

30564 (EPRI-CS—4404-Vol.1, pp 1.1-1.7) **Regulatory framework for future particulate technology needs.** Meyers, S. (Environmental Protection Agency, Washington, DC). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The Federal Register notice of March 20, 1984 is discussed in relation to particulates. The document consists of a proposed standard; monitoring, reference and equivalent methods; and proposed rules for ambient air quality. There has been a proposal to change the way particulate matter is measured for the primary standard. There is a proposal to abandon the total suspended particulates method in favor of a method that includes only particles small enough to penetrate to the more sensitive parts of the human respiratory tracts. The new indicator would be particles of 10 micrometers or less, called PM_{10}. New concentration levels for the primary standards are to be established. For the 24 hour standard, a new level would be a number from the range 150 to 250 micrograms per cubic meter. For the annual standard, a new level would be a number from the range of 50 to 65 micrograms per cubic meter. It is proposed to replace the current 24 hour secondary standard with an annual total suspended particulate secondary standard from the range of 70 to 90 micrograms per cubic meter. For the secondary standard, the particulate matter would continue to be measured by the high volume air sampler which measures total suspended particulates.

30565 (EPRI-CS—4404-Vol.1, pp 2.1-2.7) **Impact of coming particulate control requirements on the utility industry.** Preston, G.T. (Electric Power Research Institute, Palo Alto, CA). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

An overview is presented of the evolution of regulatory requirements and control technology over the past 40 years. There are three regulatory eras which are important in considering the impact of particulate control requirements: (1) the era of no regulation; (2) the Clean Air Act era; and (3) 1985 and beyond. Each of these eras is characterized by distinct impacts on, and responses by, the electric utility industry concerning collection efficiency requirements, cost of the hardware, and the operability and reliability of the hardware. It is clear that further reduction in particulate emissions are much harder technologically than the reductions that have been achieved so far, and that to progress further the technologies will have to offer cost improvements as well as collection efficiency improvements.

30566 (EPRI-CS—4404-Vol.1, pp 3.1-3.6) **Impact of coming particulate control requirements on the iron and steel industry.** Young, E.F. Jr. (American Iron and Steel Institute, Washington, DC). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The steel industry has made major strides in control of particulate emissions. The controls now in use are examined in light of proposed new standards that will emphasize control of PM10 rather than Total Suspended Particulate matter.

30567 (EPRI-CS—4404-Vol.1, pp 4.1-4.11) **Impact of particulate control requirements: large manufacturer's viewpoint.** Braden, H.H. (Research-Cottrell, Inc., Somerville, NJ). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

The traditional role of the manufacturer in the air pollution control business is to develop the applications base required to permit the sale of equipment with acceptable performance guarantees backed up by financial penalties. At the present, in anticipation of more stringent Federal regulations in the area of fine particulate emissions and in anticipation of acid rain legislation which will affect the particulate collection capability of existing equipment, the author and others are conducting extensive testing programs to develop a reliable applications base. It is not anticipated that new and advanced technology is needed or is being developed to address these areas. Properly designed and constructed precipitators, and fabric filters from conventional designs can meet the collection performance demanded by the proposed new requirements. There is adequate production capacity in place to meet the market demand for new particulate collection equipment on almost any conceivable schedule. 6 figures.

30568 (EPRI-CS—4404-Vol.1, pp 5.1-5.5.3) **Future particulate regulations: the view of the small manufacturer.** Orem, S.R. (Industrial Gas Cleaning Institute, Alexandria, VA). Feb 1985. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920156. (CONF-840859—Vol.1).

From 5. symposium on the transfer and utilization of particulate control technology; Kansas City, MO, USA (27 Aug 1984).

All manufacturers of particulate control apparatus, small and large, have genuine concerns influenced by evolving policies in the near term. Some of these which are discussed include: PM10 - fine particle standards; acid deposition control; industrial boiler NSPS; requirements of fluid-bed combustion; and the increasing complexity of doing business with more competition and increasing cost.

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 30505, 30758

30569 (SRO—819-16, pp 44-47) **Division of Wetlands Ecology FY-1985 highlights.** Sep 1985. NTIS, PC A08/MF A01. File Number DE86005256.

In Ecological research at the Savannah River Ecology Laboratory. Annual report for the period ending July 31, 1985.

The mission of the Division of Wetlands Ecology is to conduct basic and applied ecological research on wetlands of the southeastern US and to communicate results of this research to the scientific community, government agencies and general public. Major emphasis in FY-1985 has been on ecological processes and functions in stream and river floodplain systems and the effects of man-made and natural disturbances on these ecosystems. Studies have been conducted to: examine the population dynamics of swamp forest plant species, and the development and maintenance of major wetland plant community types, describing limits on regeneration of dominant forest species; compare the net primary productivity of wetland plant and animal species under controlled and naturally occurring disturbance regimes; describe patterns of genetic variation in dominant wetland forest species; characterize and compare the development and importance of lower trophic communities in thermal, post-thermal, and natural stream ecosystems; examine potential soil nutrient loss in response to disturbance across a moisture gradient ranging from upland to wetland sites; and characterize the water chemistry of SRP streams and floodplains, with evaluations of natural variations and effects of SRP and off-site industrial activities on water quality.

30570 (SRO—819-16, pp 81-82) **Division of Stress and Wildlife Ecology FY-1985 highlights.** Sep 1985. NTIS, PC A08/MF A01. File Number DE86005256.

In Ecological research at the Savannah River Ecology Laboratory. Annual report for the period ending July 31, 1985.

The major objective of the Division is to examine the influences of natural and man-made stressors on plant and animal populations and communities, primarily in southeastern ecosystems. Special attention is given to understanding the ecology and life history of wildlife populations, particularly those native to the SRP. The research programs are ultimately designed to assess the responses of populations and communities to various perturbations, but emphasis is placed on basic ecological studies that establish the solid foundation of information necessary to conduct applied research. Specific studies have looked at the availability and utilization of habitat types by various species. Biomass and reproduction studies on different vertebrate species have yielded comparative information on variation between populations in different geographic regions. Research on the endangered species that occur on the SRP has provided background data necessary to allow SREL scientists to recommend control and mitigation measures for the American alligator and wood stork. Investigations of waterfowl utilization patterns in reactor-affected and unaffected aquatic habitats on the SRP have yielded valuable information on the effects of reactor operations on these game species. Electrophoretic and morphological measurements have been made on a number of the local vertebrate species in addressing problems in genetics and population dynamics. Special emphasis has been placed on the actual or potential effects of reactor operations on fish, including larval fish in riverine swamp systems, and on several game and non-game species of reptiles and mammals.

30571 **Addendum to the distribution of two herptiles in Idaho.** Reynolds, T.D.; Laurance, W.F. (Dept. of Energy, Idaho Falls). *Great Basin Naturalist;* **45**: No. 2, 291-292(30 Apr 1985).

Due to an error in printing quality of an earlier article, the distribution maps for the night snake (Hypsiglena torquata) and the tiger salamander (Ambystoma tigrinum) in Idaho are reprinted. 2 references, 2 figures.

30572 **Climatic change and the broad-scale distribution of terrestrial ecosystem complexes.** Emanuel, W.R.; Shugart, H.H.; Stevenson, M.P. (Oak Ridge National Lab., TN). *Climatic Change;* **7**: 29-43(1985).

The broad-scale distribution of terrestrial ecosystem complexes is determined in large part by climate and can be altered by climatic changes due to natural causes or due to human activities such as those leading to increasing atmospheric CO_2 concentration. Classifications that recognize the dependence of natural vegetation on climate provide one means of constructing maps to display the impact of climatic change on the geography of major vegetation zones. A world map of the Holdridge Life-Zone Classification, developed from approximately 8000 meteorological records, is compared with a Holdridge Map with average temperature increments simulated by a model of climate under elevated atmospheric CO_2 concentration. The largest changes are indicated at high latitudes, where the simulated temperature increase is largest and the temperature intervals defining life zones are smallest. Boreal Forest Zones are replaced by either Cool Temperate Forest or Cool Temperate Steppe, depending on average precipitation. Changes in the tropics are smaller. However, in some regions, Subtropic Moist Forest is replaced by Tropical Dry Forest. 29 references, 5 figures, 1 table.

30573 **Impact theory of mass extinctions and the invertebrate fossil record.** Alvarez, W.; Kauffman, E.G.; Surlyk, F.; Alvarez, L.W.; Asaro, F.; Michel, H.V. (Univ. of California, Berkeley). *Science (Washington, D.C.);* **223**: No. 4641, 1135-1141(16 Mar 1984).

There is much evidence that the Cretaceous-Tertiary boundary was marked by a massive meteorite impact. Theoretical consideration of the consequences of such an impact predicts sharp extinctions in many groups of animals precisely at the boundary. Paleontological data clearly show gradual declines in diversity over the last 1 to 10 million years in various invertebrate groups. Reexamination of data from careful studies of the best sections shows that, in addition to undergoing the decline, four groups (ammonites, cheilostomate bryozoans, brachiopods, and bivalves) were affected by sudden truncations precisely at the iridium anomaly that marks the boundary. The paleontological record thus bears witness to terminal-Cretaceous extinctions on two time scales: a slow decline unrelated to the impact and a sharp truncation synchronous with and probably caused by the impact. 50 references, 4 figures.

30574 **Integrating forest-stand simulations with paleoecological records to examine long-term forest dynamics.** Solomon, A.M.; Shugart, H.H. (Oak Ridge National Lab.,TN). pp 333-356 of State and change of forest ecosystems - indicators in current research. Agren, G.I. (ed.). Uppsala, Sweden; Swedish University of Agriculture Science (1984). Contract W-7405-ENG-26.

Computer models permit us to study the future dynamics of present-day forests. Before applying a simulation model to predict long-term behavior of a forest, the model output should be tested against appropriate forest data. A forest-stand simulation model (FORET) and one of its variants (FORET) have been tested with time-parallel simulations in which climate variance was inferred directly from pollen chronologies (internal consistency) and from such independent sources as other pollen chronologies, regional periglacial geomorphology, and global climate model output (authenticity). Comparison of simulation output translated into inferred pollen, with actual pollen chronologies, confirmed the reliability and adequacy of the model for certain predictive tasks, e.g., estimating response of forest biomass storage to expected CO_2-induced warming. 82 references, 5 figures, 3 tables.

30575 Forty-fourth breeding bird census. *American Birds;* **35**: No. 1, 95-96(Jan 1981).

The forty-fourth breeding bird census is presented for these plots in the Alaskan North Slope. Information on species occurrence and breeding behavior is summarized.

30576 External factors influencing mineralization and immobilization of some radionuclides from tree litter. Witkamp, M. (Oak Ridge National Lab., TN). pp 231-240 of Isotopes and radiation in soil organic-matter studies. Vienna, Austria; International Atomic Energy Agency (1968).

Kinetics of mineral elements in forest litter are being studied at Oak Ridge National Laboratory using radiotracer techniques. Special emphasis is placed on the cycling of long-lived fallout nuclides because of their potential health hazard in the food chain to animals and man. Data are being obtained from in-vitro, microcosm, and field experiments and their interpretation is helped by systems analysis and analogue computer simulation of mineral flow. The results indicate that during the usual microbial bloom of newly incubated litter, loss of minerals by leaching may be reduced by as much as 50% as a result of their immobilization in microbial tissue. Only on the most rapidly decomposing litters will initial mineralization prevail over immobilization. After the bloom, release of accumulated minerals from the declining population and from the decaying substrate results in net mineralization which is proportional to the weight loss of the substrate. Faunal consumption of litter also enhances mineral turnover by exposing cell contents. Faunal consumption of microbial mass results in decreased immobilization of nuclides. Under favorable conditions, net and gross microbial immobilization by the microflora may amount to 22% and 61%, respectively, of the initial quantity of ^{137}Cs in the litter. In field experiments on the forest floor, rates of mineral turnover vary greatly in time as a result of changes in weather conditions. Consequently periods of net immobilization in the forest are short and the average per cent net immobilization is lower than that found in the laboratory. Thus, even though the microbial and faunal compartments are relatively small as compared with other litter compartments, their role in mineral kinetics is appreciable because of high rates of turnover. 8 references, 3 figures

30577 Long-term ecological study in the Oak Ridge area. III. The oribatid mite fauna in pine litter. Crossley, D.A. Jr.; Bohnsack, K.K. (Oak Ridge National Lab., TN). *Ecology;* **41**: No. 4, 628-638(Oct 1960).

From 215 samples (approximately 3000 sq cm) of pine forest litter taken in the Oak Ridge area during the summer of 1956, a total of 30,371 arthropods were obtained. Particular attention was directed toward the oribatid mites. The samples were taken from 3 similar areas, each of which was represented by 3 stations. Three samples were taken from each station each week for a period of 8 weeks during July and August. Thus, a hierarchic measure of the variation in abundance was obtained for the more abundant oribatid species. Results of analysis of variance tests showed that significant variation occurs both between stations within areas and between the areas, for certain of the abundant oribitid mites. The trellis diagram method was used to detect significant joint occurrences between species; only a single recurrent group of species was found. Although the 3 study areas have different relative abundances of certain of the more numerous species, it is concluded that the differences between areas represent local variations in a single oribatid fauna, rather than elements of 2 or more faunas. 23 references, 3 figures, 6 tables.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 29329, 29330, 29432, 30544

30578 (CONF-8511179—1) Exploration of the relationships among acidic deposition, land use, and water chemistry. Malanchuk, J.L.; Mallon, G.J.; Olson, R.J. (Environmental Protection Agency, Washington, DC (USA); Oak Ridge National Lab., TN (USA)). 1985. Contract AC05-84OR21400. 23p. NTIS, PC A02. File Number DE86008885.

From North American Lake Management Society meeting; Lake Geneva, WI, USA (13 Nov 1985).

Many watershed characteristics, either by themselves or in combination with acidic deposition, have been shown to influence the acidification of lakes. Correlations and linear regressions were calculated for pairs of watershed characteristics and water chemistry measurements to statistically test, using observational data, these relationships. The study included a subset of 46 headwater lakes in the Adirondack Mountain region of New York State that were common to both the National Surface Water Survey (providing water chemistry data) and the Adirondack Watershed Data Base (providing watershed attribute data). Wet deposition and lake elevation showed strong, negative relationships with both lake pH and alkalinity, although elevation may act as a surrogate variable for other factors, such as soil type, vegetation type,and deposition level. Conifer vegetation, historical fire activity, and wetlands, expressed as the percentage of watershed area, also showed significant, negative relationships with lake pH and alkalinity. Thus, several hypotheses concerning the association of watershed attributes with lake acidification are supported and should be given further consideration in research planning, field surveys, and assessment activities.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 29340, 29407, 29430, 29434, 29446, 30701

30579 (AECL—8380) Use of the food-chain model FOOD III and the soil model SCEMR to assess irrigation as a biosphere pathway. Sheppard, S.C. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Feb 1985. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE85900459.

Work performed under Canada/US Waste Management Information Exchange Agreement.

Irrigation of contaminated water onto crop land is a relatively direct pathway for radionuclides to deliver a radiation dose to man. Irrigation was not originally included in the SYVAC assesmsnet model for the Precambrian Shield because no irrigation is currently practiced in the region. This report re-evaluates this decision. An analysis of meteorological data shows that crop yield in northern Ontario would benefit from irrigation. Thus, incentives are present for subsistence-scale, and perhaps commercial-scale, irrigation of surface or well water. A food-chain analysis indicated that irrigation with contaminated water could deliver a dose comparable to direct consumption (drinking) of the same water, for some radionuclides. Long-term contamination of soil through irrigation was predicted to be a substantial hazard, even when soil leaching was incorporated into the food-chain model. This report presents parameter estimates that could be used to incorporate irrigation as a pathway in the SYVAC code and will constitute the basis for further decisions concerning this pathway.

30580 (DOE/ER/60134—2) Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986. Linsalata, P. (New York Univ., NY (USA). Inst. of Environmental Medicine). Feb 1986. Contract AC02-83ER60134. 174p. NTIS MF A01; 2; GPO Dep. File Number DE86010235.

The field study is to assess the soil-to-plant and soil-to-animal concentration factors of the naturally occurring radionuclides ^{226}Ra, ^{228}Ra, ^{232}Th, ^{230}Th, and ^{228}Th, as well as of the light rare earth elements (REE), La, Ce and Nd. Farms situated near the center of a deeply weathered alkalic intrusive known as the Pocos de Caldas (PC) plateau were selected for study because of their proximity (i.e., within a few kilometers) to what may be the largest single near-surface deposit of Th (~30,000 tonnes) and REE's (>100,000 tonnes) situated near the summit of a hill (the Morro do Ferro (MF)). An ancillary field study is being conducted in Orange County, New York, where a local cattleman has permitted sampling members of the herd as well as soil and feeds which are all grown on the premises. Vegetable samples and soil have also been analyzed from five additional farms in Orange County, NY. 64 refs., 25 figs., 45 tabs.

30581 **(DOE/ID—12106) Radiation exposure rates and radionuclide concentrations in soil around the Argonne National Laboratory-West Site.** Dickson, R.L. (USDOE Idaho Operations Office, Idaho Falls). Mar 1986. 27p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008893.

As part of the routine environmental monitoring program at the Idaho National Engineering Laboratory, exposure rates were measured around the Argonne National Laboratory-West Site in 1973, 1976, and 1980, and soil samples were collected in 1978. Elevated exposure rates were measured along the northern and western sides of the EBR-II facility, in a drainage ditch on the west side of the EBR-II facility, around the perimeter of the radioactive scrap and waste facility, and at the southwest corner of the TREAT facility. Exposure rates measured in the 1980 survey were all less than 30 μR/h. Overall results indicated that except for the drainage ditch, the operation of the nuclear facilities for the past 21 years has not produced any general contamination of the soil around the ANL-W Site.

30582 **(DP—1717) Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan.** Johnson, T.L. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Feb 1986. Contract AC09-76SR00001. 47p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009571.

A field test facility has been designed and installed to obtain data on the vegetative uptake of radionuclides from buried low-level radioactive waste. The waste is a cement-like, solidified salt solution known as saltstone. The facility consists of 32 lysimeters (containers 6 feet in diameter and 6 to 10 feet in depth) holding buried saltstone at varying depths, and with varying types of vegetation grown at the surface. Vegetation, soil, and groundwater samples will be analyzed for Tc-99, Sr-90, I-129, Cs-137, and other radionuclides. Groundwater will also be analyzed for other water quality parameters, including nitrates.

30583 **(EGG—10282-1084) Aerial radiological survey of the Feed Materials Production Center and surrounding area, Fernald, Ohio. Date of survey: April 1985.** (EG and G Energy Measurements, Inc., Las Vegas, NV (USA)). Oct 1985. Contract AC08-83NV10282. 17p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86006849.

An aerial radiological survey was performed over the area surrounding the Feed Materials Production Center, located near Fernald, Ohio, during the period April 24 to 27, 1985. The survey covered a 70-square-kilometer (27-square-mile) area centered on the plant. The highest exposure rates, in excess of 0.35 milliroentgens per hour (mR/h), were inferred from the data measured directly over the plant. This radiation was due to the presence of nuclides which were consistent with normal plant operations. For the remainder of the survey area, the inferred radiation exposure rates, varying from 6 to 12 microroentgens per hour (μR/h), were due to naturally-occurring potassium, uranium, thorium, and daughter products. The reported exposure rate values include an estimated cosmic ray contribution of 3.7μR/h. Ground-based measurements, conducted during the time of the aerial survey, were compared to the aerial results. Pressurized ionization chamber readings and a group of soil samples were acquired at several locations within the survey area. The exposure rate values obtained from these measurements were in agreement with the inferred aerial results. Soil sample results showed several areas just outside the site boundary with slightly elevated amounts of U-238. The levels, however, were well below the detection limit of the aerial system. The only off-site area that showed apparent above background activity in the aerial data was directly west of the storage silos. The symmetric shape of the contours, however, suggests that these elevated levels are due to "shine" from material stored on-site in the silos and not to actual off-site contamination. Detailed comparison of the 1985 aerial survey data with a previous survey conducted in 1976 showed no significant change in any area outside the plant boundary. 6 refs., 9 figs., 3 tabs.

30584 **(ORNL—6271) Environmental surveillance of the Oak Ridge Reservation and surrounding environs during 1985.** (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA)). Apr 1986. Contract AC05-84OR21400. 345p. NTIS, PC A15/MF A01; 1; GPO Dep. File Number DE86010066.

Routine monitoring and sampling for radiation, radioactive materials, and chemical substances on and off the Oak Ridge Reservation are used to document compliance with appropriate standards, identify undesirable trends, provide information for the public, and contribute to general environmental knowledge. Regional stations located at distances of up to 140 km (90 miles) from the ORR provide a basis for determining conditions beyond the range of potential influence of the three Oak Ridge installations. Stations within the Reservation, around the perimeters and within each plant site, and in residential and community areas document conditions in areas occupied and visited by the public and potentially affected by the Oak Ridge operations. In all, during 1985 some 115,000 analyses of environmental samples were completed as part of the Reservation-wide and regional monitoring program. Included were approxiately 61,000 air, 41,000 surface water, 8090 groundwater, 2400 wastewater, 80 fish, 231 soil, 132 grass, 36 pine needle, 360 sediment, and 80 external gamma analyses.

30585 **Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington.** Rickard, W.H.; Price, K.R. (Pacific Northwest Lab., Richland, WA). *Environmental Monitoring and Assessment;* 4: 379-388(1984). Contract AC06-76RL01830.

Iodine-129 in controlled amounts has been released into the air from the operating chemical separations facilities on the Hanford Site. Small amounts of ^{129}I have accumulated in surface soils especially at locations near the chemical separations facilities. Enriched levels of ^{129}I also occur in the thyroid glands of mule deer (Odocoileus hemionus) residing on the Hanford Site. Stable iodine is present in low concentrations in Hanford Site soils and it is not avidly accumulated by wild plants. Soils at high elevations have greater concentrations of ^{129}I than low elevations soils. Mule deer thyroids had higher concentrations of stable iodine than the thyroids of black-tailed jack rabbits. Stable iodine in black-tailed jack rabbit thyroids varied with the season with maximal concentrations in summer. Iodine-131 has not been released into the air from operating chemical separations facilities for more than 10 yr. Because of its short half-life ^{129}I of Hanford Site origin has disappeared from the Hanford Site. In the event of a future restart of the chemical separations facilities black-tailed jack rabbits can be used as biological indicators of ^{129}I in the terrestrial environment of the Hanford Site. 28 references, 3 figures, 2 tables.

30586 **Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides.** Vandegrift, G.F.; Bowers, D.L.; Gerding, T.J.; Fried, S.M.; Wilbur, C.K.; Seitz, M.G. (Argonne National Lab., IL). *ACS Symposium Series;* No. 246, 229-247(1984).

From 185. meeting of the American Chemical Society; Seattle, WA, USA (20-25 Mar 1983).

Experiments are being performed at Argonne National Laboratory (ANL) (1) to identify interactions of radionuclides and repository components that effect nuclide migration and (2) to assess changes in nuclide migration caused by modifications expected upon aging of the waste, backfill, and rock. This paper describes the philosophy of these experiments, the experimental set up, and some early results of this effort. The experiments are conducted with radioactive borosilicate glass, bentonite and mechanically fissured basalt rock in flowing water analogous to their configuration in a breach of a nuclear waste repository. Changes undergone by the groundwater as it passed through the fissure include: (1) drop in pH from 10 to 8, (2) loss of suspended particulate, and (3) loss of dissolved/suspended U, Np, and Pu. These effects, also studied as functions of radiation dose and of laboratory aging of the repository components, are related to the predicted long-term performance of a nuclear waste repository. 15 references, 4 figures, 6 tables.

30587 **Retention of simulated fallout particles by lichens and mosses.** Taylor, F.G.; Witherspoon, J.P. (Oak Ridge National Lab., TN). *Health Physics;* **23**: 867-869(Dec 1972).

Lichen and moss tussocks or mats of uniform size were placed in the field and contaminated with a fallout simulant containing Cesium 134. A mass load of 5.0 g of particles per ft^2 of soil surface area, with a total activity of 3.5 microcuries $/ft^2$ was applied to 21 tussocks of each species. The fraction of the initial deposition intercepted by lichens as similar to that reported for grass species. Mosses, however, intercepted a much greater fraction; the contamination factor was 2-3 times greater for moss than for lichen. Moss tussocks had a greater area of foliage per unit of soil area due to the many individual plants and numerous small leaves which are effective trapping sites for particles. Following deposition of the simulant there was a rapid loss of particles for the first day. After the first day (there was a rain event) particle losses showed greater variation in loss rates throughout the experiment. Except for the first rainfall event, precipitation seemed to have little effect on particle retention. 12 references, 1 figure, 1 table.

30588 **Loss of weight, ^{60}Co, and ^{137}Cs from tree litter in three subsystems of a watershed.** Witkamp, M.; Frank, M.L. (Oak Ridge National Lab., TN). *Environmental Science and Technology;* **3**: No. 11, 1195-1198(Nov 1969).

Losses of weight, ^{60}Co, and ^{137}Cs from alder, sycamore, and oak leaves exposed for one year in a forest, a pond, and a brook, were exponential. Loss coefficients increased in the order: weight < ^{60}Co < ^{137}Cs at the ratio 1:1.9:4.1. For species loss, coefficients increased in the order: alder < sycamore < oak at the ratio 1:2.7:4.6. The effects of site, species, and substance were highly significant (P = 0.1%), and without significant interaction (P = 10%). Differences between weight and minerals appear to be controlled primarily by leachability, differences between species by microbial breakdown rates, and those between sites by rates of leaching and mechanical abrasion. 5 references, 2 figures, 2 tables.

30589 **Uptake of waste Sr 90 and Cs 137 by soil and vegetation.** Graham, E.R. *Soil Science;* **86**: No. 2, 91-97(1958).

A study of the uptake of Sr 90 and Cs 137 by the primary vegetation and some properties of the White Oak Lake bed area revealed the following: The radioactive nuclides of the area are heterogeneously distributed in the surface material. The higher levels of radioactivity are associated with high pH values and a relatively greater salt content. The total Sr 90 uptake by Polygonum lapathifolium varied from 0.057 to 0.178 μc./100 g. dry plant material. The low concentration was associated with the high Na and high Ca sections of the area. The best soil index associated with the plant uptake of Sr 90 under these conditions was the concentration of Sr 90 in the saturation extracts. The total Cs 137 uptake by Polygonum lapathifolium varied from 0.133 to 0.334 μc./100 g. dry plant material. The higher uptake was associated with the moderately low supply of available K in the sediment. 12 references, 5 tables.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 29310, 30584

30590 **(DOE/BP/18966—1) Ural-Tweed bighorn sheep - wildlife mitigation project. Annual report, 1 September 1984-31 December 1985.** Yde, C.; Christensen, A.; Godtel, D. (Montana Dept. of Fish, Wildlife and Parks, Kalispell (USA)). Feb 1986. Contract AI79-84BP18966. 42p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008310.

This report summarizes the results of the project activities from 1 September 1984 to 31 December 1985. To date habitat treatments have been initiated on 7 areas. The treatments include selective slash and burn, prescribed fire and fertilization. Inclement weather precluded the completion of the prescribed burns scheduled during the fall within the South Sheep Creek and Lower Stonehill units. Extensive pretreatment vegetative information was collected from all units scheduled for habitat manipulations during 1985. Additionally, future projects have been delineated for other areas frequented by bighorn sheep. Eight adult bighorn sheep (4 ewes and 4 rams) were fitted with radio transmitters. Systematic aerial and ground surveys were utilized to monitor the movements and seasonal habitat preferences of the radio-collared sheep. Age and sex information was gathered whenever possible to aid in the development of a population simulation model. Monthly pellet group collections were initiated in May to provide samples for 2.6 diaminopimetic acid (DAPA), food habits and lungworm larvae analysis. The majority of the data analysis is ongoing and will be presented in later reports.

30591 **(DOE/EV/01525—T6) Potential responses of tundra ecosystems to perturbations from energy development. Part I. Annual report, 1983.** Oechel, W.C. (San Diego State Univ., CA (USA). Systems Ecology Research Group). [1986]. Contract AC03-77EV01525. 179p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86008919.

The necessity to determine general effects of perturbations in the arctic resulting from energy development is the impetus for this research which quantifies the patterns of water and nutrient flux from fellfield through tussock tundra into riparian plant communities. The evaluation of the effects of this mass flow on plant productivity is one of the objectives of the proposed research. The second major goal is to quantify the effects of changes of this water and nutrient flux resulting from slope perturbations, such as increased water flow, fertilizer application, blading and vehicle tracks. Demographic studies of fellfield, tussock tundra, and riparian vegetation and the dynamics of rodent activity in regard to nutrient transfer will broaden the understanding of the biology of a small watershed. Results of the integrated subprojects will be used to test the main hypotheses of this project which concern patterns of water and nutrient flux from slopes into the riparian vegetation as a results of slope perturbations. With the obtained information, nutrient and water flux routines of ARTUS will be expanded, and a specific slope and watershed model developed.

30592 **Land use model with a constant-utility spatially variant wage.** Jones, D.W. (Oak Ridge National Lab., TN). *Geographical Analysis;* **16**: No. 2, 121-133(Apr 1984).

Pointing to the absence of a labor market equilibrium condition in any rural applications of the Thunen model, the author finds that the correct specification recognizes labor as a special input which consumes. The wage must be free to vary to perform the compensation required to keep utility the same at all locations. As the wage varies spatially, both labor intensity (employment) and rents are affected. The correct specification of the labor market in the land use model actually produces a simple amenity model. The amenity is the ability to consume farm goods at a lower cost or the disadvantage of consuming market goods only at higher cost. Most amenities occur at random sites, and may or may not physically disperse over contiguous locations. The model only predicts a pattern of components, not where amenities will be found. 13 references.

5106 Regulations

REFER ALSO TO CITATION(S) 29331

30593 (CONF-850314—Vol.2, pp 107-111) **Framework for resolving hazardous waste cleanup liability.** Redding, M.J. (Kellogg Corp., Littleton, CO). 1985. Arizona Board of Regents, Tucson, AZ. File Number TI85015357.

From Waste management '85; Tucson, AZ, USA (24 Mar 1985).

The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or Superfund) dictates that hazardous waste disposal sites be cleaned up. It also identifies parties who are liable for all costs incurred in cleanup of a facility having a release or threatened release, and damages for injury to, destruction of, or loss of natural resources. The costs incurred in cleaning up a site can become enormous. Most sites are multi-party sites and cleanup actions will involve difficult and complex responsibility determinations. In order to facilitate the process of determining cleanup liability and assure a fair and equitable allocation of this liability, a framework is proposed which is based on problem resolution methodology developed and tested on over 700 contract dispute resolutions. The framework presented here is based on the

identification and management of a common factual data base. This documentation is then used in a systematic approach to identify responsible parties and wastes attributed to each party, and to allocate site cleanup cost responsibility with provisions for expert input and responsible party negotiations. Each responsible party has the opportunity to negotiate based on relevant facts and to resolve the issues before they reach litigation.

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 29493, 30570

30594 **(DOE/RL/02225—19) Control of productivity and population characteristics in aquatic communities. Progress report, 1 September 1982-31 August 1983.** Edmondson, W.T. (Washington Univ., Seattle (USA). Dept. of Zoology). 1 Sep 1983. Contract AM06-70RL02225;AT06-71EV70023. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008682.

The report discusses progress in research on several alkaline lakes in Washington State. In two lakes, Lake Lenore and Soap Lake, the effect of introduced cutthroat trout on the species structure of plankton and benthic communities is being studied. In Hall Lake, the pattern of changes in nutrient concentrations in the monimolimnion of a meromictic lake are being followed. (ACR)

30595 **(DP-MS—85-119) Feasibility study of wood stork foraging habitat mapping using landsat multispectral data.** Jensen, J.R.; Hodgson, M.E.; Coulter, M.; Mackey, H.E. Jr. (South Carolina Univ., Columbia (USA). Dept. of Geography; Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1986. Contract AC09-76SR00001. 19p. (CONF-8603101—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008904.

From Freshwater wetlands and wildlife symposium; Charleston, SC, USA (24 Mar 1986).

The wood stork is a large wading bird which forages in shallow wetlands up to 70 kilometers from the colony. Landsat data were evaluated to determine if remote sensing data were suitable for locating and estimating the extent of potential foraging habitat for this species over such a large range. Thematic Mapper data of north-central Georgia and the Savannah River floodplain in South Carolina were obtained May 5, 1984. Spectral signatures from known foraging sites near a colony in Georgia were identified. Computer clustering techniques were used to identify and map shallow water and marsh wetland foraging habitats. Foraging acreages were computed, and maps of the locations of candidate foraging sites were produced for a 1520-square-kilometer area. Remote sensing appears to provide a feasible method of evaluating the regional wetland foraging habitat available to this wide-ranging species.

30596 (EPRI-EA—4438, pp 1.3-1.13) **Overview of risk assessment in aquatic ecology.** Hartung, R. (Univ. of Michigan, East Lansing). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

An overview is presented of environmental risk assessment. Four categories of toxicological problems are discussed. The simplest one to study is where the exposure is known, the effects are also known, and there is no question of causality. In the second category exposure is known and definable and the concentration of the toxicant is known. The point of the investigation is to try to see if there is an effect. In the third category, there is no identified exposure, but there is an observable effect in the environment. The task is to find the etiologic agent producing the effect. In the fourth category there are large numbers of unknowns. The projected exposure is expected to occur and the effect is expected to be prevented. Causality in this case is developed in model systems. The need is to extrapolate and verify that an effect which could be expected to occur might occur.

30597 (EPRI-EA—4438, pp 1.15-1.27) **Evaluating environmental exposure through innovative biological tests.** Eaton, J. (Environmental Protection Agency, Duluth, MN). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

Standardization of aquatic toxicology test procedures, while useful in many regards, has tended to inhibit development of innovative biological testing that could provide a better basis for evaluating aquatic hazards posed by toxic agents. Reliance on the routine techniques has fostered complacency among aquatic toxicologists and discouraged interdisciplinary exchange of different types of relevant information. One of the ways hazard evaluation could be improved is through the application of more fate information to toxicity test design. Fate data describe the nature of the exposure of organisms to a toxicant in the field. Indeed, it may not be appropriate in the case of most test materials to do any biological testing until an adequate fate profile is available. Development of such a profile requires the cooperation of chemists, biologists and modelers to determine the important elements that should be included in each analysis (i.e., to define adequate). In some cases sufficient data for profiles are already available that have not been utilized in selecting and designing tests. Fate profiles could be quite general - related to the major environmental characteristics of entire categories of toxicants - or could be very specific. The important aspect is not in the development of the fate profiles themselves, but in how they would drive development of new or modified biological tests. One or more of several unique biological test conditions might be incorporated into these test designs, their selection being based on field exposure parameters. Several examples are described where knowledge or estimations of fate have resulted in more relevant biological tests or in more appropriate hazard evaluations.

30598 (EPRI-EA—4438, pp 2.29-2.51) **Use of a population model for estimating hazards: interpretation of low pH bioassay results with respect to Norwegian trout populations.** Sadler, K. (Central Electricity Research Labs., Nottingham, England). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

Bioassay experiments are often the only method available to evaluate the relative importance of, and interaction between, the various factors affecting fish populations. Population models are then required in order to interpret the results of these in terms of their relevance to natural populations. As an example of this approach, data from the literature concerning several Norwegian brown trout (Salmo trutta) populations are used to construct Leslie matrices in order to estimate their capacity to withstand egg and fry mortalities. These estimates are compared with mortalities found in bioassay studies conducted at pH 4.5 and at various calcium concentrations in order to predict the percentage of trout populations which would be able to survive these conditions. These predictions are in good agreement with the observed fishery status of acidic Norwegian lakes at calcium concentrations 30μeq l^{-1}, but above this concentration the recorded status is worse than predicted. Likely causes for this difference are considered to be effects acting on fish older than those used in the bioassay experiments (either mortality or reduction in fecundity possibly due to impaired growth) or the effects of other water quality factors. These effects need only be fairly slow acting as compared with the egg and fry mortalities so far studied in detail. Thus, the discrepancy between predicted and observed results at pH 4.5 and 50 μeq l^{-1} calcium could be caused by an additional 80% mortality acting over the 4 to 8 year period before maturation. An additional factor which could result in the observed fishery status being worse than predicted is temporal variation in water chemistry which is not assessed in the survey of Norwegian lakes. In particular, the adverse conditions occurring at time of snowmelt could be critically important. 47 references, 7 figures, 1 table.

30599 (EPRI-EA—4438, pp 2.53-2.62) **Use of time series methods for estimating hazard.** Hacker, C.S.; Thompson, J.R. (Univ. of Texas, Houston). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

During the past decade the awareness of the public of the untoward effects of many human activities on the quality of the environment has increased. The legislation and governmental regulations that have been written in response to this awareness have been responsible in part for stimulating research on assessing the hazardous effects of human activity on biological communities. However, the dynamic behavior of an ecosystem and the potential complexity of the interaction among the populations that form an ecosystem make this research difficult. A useful tool for evaluating fluctuations that occur in populations is a model of those dynamics. The authors summarize the use of time series techniques to develop such models. 12 references.

30600 (EPRI-EA—4438, pp 2.63-2.81) **Statistical approaches for quantitatively assessing ecological impacts and risks.** Thomas, J.M.; Van Voris, P. (Battelle Pacific Northwest Labs., Richland, WA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

The quantitative detection of other than very large ecosystem level effects using field monitoring and statistical techniques is currently beyond the state-of-the art in quantitative ecology. However, several good prospects for detecting and quantifying some population level effects exist. A field monitoring design suggested by Eberhardt offers the additional possibility that cause can be assigned to observed population changes. Attention is focused on the statistical analysis procedures, field design, and sample size estimates needed to detect benthic and planktonic population impacts. Owing to lack of appropriate design, current monitoring programs probably will fail to provide useful scientific information regarding the question of impact on populations. Properly designed and statistically evaluated field studies can contribute to the risk assessment in aquatic ecosystems. The ability to measure (and assign cause for) the elimination of a single species and/or shifts in abundance of some population, may or may not affect an ecosystem. Risk assessment as practiced in biomedical contexts translates naturally to ecosystems. Thus, in the absence of realistic funding for developing quantitative methods and concomitant field techniques, the authors conclude that microcosms accompanied by appropriate single species studies offer the best economic and scientific solution. The purpose of this paper is to point out that the authors can only detect rather large changes in populations in the field and to present a possible direction for research whereby the authors can begin to address the question of risk caused by utility wastes that find their way to aquatic ecosystems. 38 references, 1 table.

30601 (EPRI-EA—4438, pp 2.83-2.100) **Ecological risk analysis: prospects and problems.** Barnthouse, L.W.; Suter, G.W. II; O'Neill, R.V. (Oak Ridge National Lab., TN). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—). Contract W-7405-ENG-26.

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

Two methods of quantifying ecological risks in probabilistic terms are discussed. In Analysis of Extrapolation Error, effects thresholds for fish species in the field are estimated, with error bounds, from observed effects on laboratory test species. In Ecosystem Uncertainty Analysis, Monte Carlo simulation and ecosystem models are used to extrapolate from laboratory toxicological data to estimated risks to populations and trophic levels. At the present state of development and validation of ecological risk models, uncertainties associated with all predictions are enormous. Although accurate predictions of absolute magnitudes of risks to populations and ecosystems are not now possible, risk analysis can be used to compare or rank sources of stress or be used to compare the relative importance of disparate sources of uncertainty in risk estimates. Limited uses of risk analysis in environmental management and regulation appear feasible, provided they are based on either water quality or on organism-level effects rather than on ultimate effects on populations/ecosystems. More ambitious applications of risk analysis in ecology are currently limited by insufficient toxicological data and by insufficient understanding of how real populations and ecosystems respond to stress. 10 references, 8 figures.

30602 (EPRI-EA—4438, pp 3.41-3.54) **Need to test assumptions of models: the population biology of sessile invertebrates on coral reefs.** Olson, R.R. (Harvard Univ., Cambridge, MA). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

Although there exists little life history data on non-cryptic coral reef invertebrates such as hard and soft corals, efforts have been made to model their population dynamics. Based on competitive networks model devised for a space-limited community, ecologists have developed a generalized model of intense competition for space among adults and between settling larvae and adults. At least one quantitative model has been published which attempts to simulate the coexistence of these species. But, have the assumptions of these models, that space is in short supply and that adults and larvae compete for space, been tested? Although physical and biological disturbance can have a profound effect on the outcome of the models, such as preventing the resource from becoming limiting, little is known about disturbance levels on coral reefs. Examination of the literature on larval ecology of many invertebrate-algal associations such as corals, shows that in any species, larvae settle and begin their growth in different habitats than adults. Thus, a fundamental assumption, that adults and larvae interact, may be invalid. This example underscores the need to examine the assumptions of a model in the field before the model is accepted. 24 references, 2 figures.

30603 **(GS-CIRC—001) Estimated use of water in the US in 1980.** Solley, W.B.; Chase, E.B.; Mann, W.B.,IV. (Geological Survey, Washington, DC (USA)). 1985. 65p. NTIS, PC A04/MF A01.

Water use in the United States in 1980 was estimated to be an average of 450 Bgd (billion gallons per day) of fresh and saline water for offstream uses - an 8% increase from the 1975 estimate and a 22% increase from the 1970 estimate. Average per capita use for all offstream uses was 2,000 gpd (gallon per day) of fresh and saline water, and 1,600 gpd of fresh water; this represents a slight increase since 1975. Although 1980 estimates of water use were higher than the 1975 estimates for all offstream categories, trends established during the periods 1970 to 1975 and 1975 to 1980 indicate a general slackening in the rate of increase of total withdrawals in comparison to the period 1965 to 1970.

30604 **(PNL—5506) Hanford site water table changes 1950-1980: data observations and evaluation.** Zimmerman, D.A.; Reisenauer, A.E.; Black, G.D.; Young, M.A. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 69p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009729.

The basalt formations underlying the Hanford site are being considered for characterization and evaluation as a deep geologic repository for defense and commercial radioactive wastes. To understand the hydrology of the Hanford area, we need to know if the ground-water system is in steady state and what impact a change in surface stress from artificial recharge may have on the underlying basalt aquifers. Researchers at Pacific Northwest Laboratory are supporting efforts to understand these issues by illustrating how changes in wastewater disposal activities at the Hanford site have altered the configuration of the water table surface with time. The objective of this work was to determine the magnitude and direction of changes in the elevation of the water table across the Hanford site from 1950 to 1980. Plots of the magnitudes of water-level changes occurring over 5-year intervals from 1950 through 1980 are presented. The water-level changes that occurred during each 5-year interval are related to water discharges from nuclear fuel reprocessing facilities or other discharge sources. The plots of water-level changes show large water-level increases in the

vicinity of the Separations Area (200 East and 200 West) from 1950 to 1960; the rate of increase of water-level changes grows more slowly from 1960 to 1970, while the areal extent of the mounding continues to expand. Only small changes occur from 1970 to 1980; during this time period, the unconfined system appears to be in approximate equilibrium with the sources. Based on previous experience, it is believed that an increase in ground-water mounding will begin to appear near the 200 East Area B Pond as a result of the increased discharges from the restart of PUREX in 1983.

30605 **Organic carbon-14 in the Amazon River system.** Hedges, J.I.; Ertel, J.R.; Quay, P.D.; Grootes, P.M.; Richey, J.E.; Devol, A.H.; Farwell, G.W.; Schmidt, F.W.; Salati, E. (Univ. of Washington, Seattle). *Science (Washington, D.C.);* **231**: 1129-1131(7 Mar 1986).

Coarse and fine suspended particulate organic materials and dissolved humic and fulvic acids transported by the Amazon River all contain bomb-produced carbon-14, indicating relatively rapid turnover of the parent carbon pools. However, the carbon-14 contents of these coexisting carbon forms are measurably different and may reflect varying degrees of retention by soils in the drainage basin. 20 references, 1 table.

30606 **Periphyton production and grazing rates in a stream measured with a ^{32}P material balance method.** Elwood, J.W.; Nelson, D.J. (Oak Ridge National Lab., TN). *Oikos;* **23**: No. 3, 295-303(1972).

Net production rates and standing crops of periphyton and grazing rates on periphyton were measured in a small, woodland stream in southeastern US using a material balance method. The material balance of radioactive phosphorus was followed at three times during the year in periphyton, consumer organisms, and stream water for up to six weeks following a one-hr release of $^{32}PO_4$ to the stream. Rates of decrease of ^{32}P in periphyton per unit weight, per unit area of substrate, and in the entire study reach of stream were used to compute biomass turnover rates of periphyton and fractions of periphyton standing crop grazed per unit area per unit time. Periphyton standing crops in July, September, and November were estimated at 200, 198, and 658 mg ash-free dry weight m^{-2}, respectively, while estimates of net production rates were 22, 24, and 16 mg ash-free dry weight m^{-2} day^{-1}, respectively. Estimated grazing rates on periphyton during these periods were 23, 15, and 14 mg ash-free dry wt m^{-2} day^{-1}, respectively. Biomass turnover rates of periphyton were in the range of those computed from other stream ecosystems which had higher standing crops and production rates of periphyton. This suggests that grazing limited periphyton production rates in this stream by controlling the standing crop of periphyton. The method is of wide applicability since less than maximum permissible concentrations of radioactive phosphorus were used in the spike releases. 29 references, 6 figures, 2 tables.

30607 **Estimates of periphyton mass and stream bottom area using phosphorous-32.** Nelson, D.J.; Kevern, N.R.; Wilhm, J.L.; Griffith, N.A. (Oak Ridge National Lab., TN). *Water Research;* **3**: 367-373(1969).

The standing crop of periphyton and actual surface area in a 100-m section of a small stream were estimated by applying material balance techniques to an experimental ^{32}P release. About 75 per cent of the introduced ^{32}P was retained initially by periphyton in the study section. Based on the quantity of ^{32}P in periphyton samples, per mg and per cm^2, the total standing crop of periphyton and the bottom area of the section were estimated as 1.5 kg and 560 m^2, respectively. 15 references, 1 table.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 30031, 30569

30608 **(BNL—37768) Cross-sectional analysis of sulfate concentrations in the surface waters of New York and New England.** Hendrey, G.R. (Brookhaven National Lab., Upton, NY (USA)). 1985. Contract AC02-76CH00016. 15p. (CONF-850944—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008007.

From Muskoka conference: international symposium on acidic precipitation; Toronto, Ontario, Canada (15 Sep 1985).

Surface water sulfate concentrations for each of the seven New York and New England states are calculated based on sulfur deposition estimated using (1) the Lagrangian model ASTRAP, and (2) by doubling wet sulfate deposition, divided by estimated surface water runoff, ignoring all other sources and sinks of sulfur. These estimators are then compared to average sulfate concentrations observed in the waters of the seven states. Deviations of predictions range from -26% to +115% of observed average state-wide concentrations for the seven states, but the regional means differ by 38% and 7%, respectively, of the observed mean. Regression of the predictions (from the ASTRAP wet plus dry sulfur deposition) on observed values has an R^2 of 0.73 and $p < 0.02$. 19 refs., 1 tab.

30609 **(CONF-860161—1) Application of a geographic information system in the study of acidic deposition.** Olson, R.J. (Oak Ridge National Lab., TN (USA)). 22 Jan 1986. Contract AC05-84OR21400. 18p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008220.

From Geographic information systems for environmental protection; Las Vegas, NV, USA (22 Jan 1986).

The Oak Ridge National Laboratory (ORNL) Geographic Information System (GIS) is a primary tool for data base management, analysis, and graphic display in the assessment of acidic deposition effects on aquatic resources in the Adirondack Mountains of New York State. Functions of the ORNL GIS include: (1) data input and digitizing; (2) data transformation and manipulation; (3) data management and extraction; (4) integration and analysis; and (5) output and display. The GIS utilized "watershed units," defined by digitizing boundaries drawn on large-scale topographic maps, to serve as common spatial units for integrating over 200 thematic variables for 463 headwater lakes. Many of the thematic variables used in the assessment involved manipulating several spatial data sets with specific algorithms to calculate levels of stress or natural conditions that could affect the aquatic resources. For example, precipitation amount and pollutant ionic concentrations were merged to estimate deposition values for each lake. Central to the GIS work is a data base management and statistical package to use with the thematic data base to develop multiple linear regression models for lake pH and alkalinity with watershed variables. Communication of the results of the assessment with computer-generated maps facilitated the understanding of complex spatial patterns and multiple geo-referenced data sets.

30610 **(ENEA-RT/PROT—83-23) Pollution problems in border karst regions.** Cigna, A.A. (ENEA, La Spezia (Italy). Dipartimento Protezione Ambientale e Salute dell'Uomo). Jan 1984. 8p. (CONF-8210347—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86901005.

From Symposium on the protection of karst; Lipica, Italy (7 Oct 1982).

Some transfrontier pollution problems in regard to water resources in karst regions are here described. The main legal aspects are pointed out and some views on the present situation in Europe are also reported. The conclusions to be drawn from this analysis as regards environmental relations between neighboring countries are included. 4 refs.

30611 **(EPRI-EA—4438, pp 2.1-2.27) Use of aquatic microcosms for hazard identification.** Giesy, J. (Michigan State Univ., East Lansing). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

The primary reason for using microcosms in predicting the effects of trace contaminants on ecosystems, rather than using single-species toxicity testing is the perceived need to be able to investigate ecosystem-level properties. Ecosystem-science and hence ecotoxicology are built on the concept that ecosystems have emergent properties such that the whole of the ecosystem is greater than the simple sum of its parts. For this reason, prediction of effects on systems other than the whole ecosystem of interest are simplifications and, thus, predictions made from any reduced system may be inaccurate. Microcosms are also a simplification. Microcosms are

models of ecosystem behavior and are intermediates between the entire ecosystem and single species toxicity tests which are conducted under laboratory conditions. Microcosms, to be useful, must be in some way structurally or functionally analogous to ecosystems or some identifiable subset of an ecosystem. To make ecosystem-specific predictions, microcosms must not only be appropriately called but closely mimic the system to which one wants to extrapolate. A powerful aspect of microcosm technology is the ability to design a system to investigate a mechanism by reducing unexplained variability. Presently, the cost of obtaining more general information by the use of multispecies tests is a loss of precision. Under the recent system of standards promulgation and litigation the loss of precision associated with multispecies testing has been unacceptable. Microecosystems as predictive tools do not merit the increased cost relative to single species tests. Several examples are presented where microcosm studies result in information which would not have been predicted from laboratory single species test. These examples represent both the influence of abiotic factors, which are often not included in laboratory-scale studies, as well as interspecific effects. 38 references.

30612 **Photooxidation of 2,4-dinitrotoluene in aqueous solution in the presence of hydrogen peroxide.** Ho, P.C. (Oak Ridge National Lab., TN). *Environmental Science and Technology;* 20: No. 3, 260-267(Mar 1986). Contract AC05-84OR21400.

The synergistic effect of hydrogen peroxide and UV radiation from a medium-pressure mercury vapor lamp on the decomposition of 2,4-dinitrotoluene (DNT) in water was studied. The results suggest that the degradation pathways of DNT in aqueous solution in the presence of hydrogen peroxide and UV light are (1) side-chain oxidation, which converts DNT to 1,3-dinitrobenzene, (2) hydroxylation of the benzene ring, which converts 1,3-dinitrobenzene to hydroxynitrobenzene derivatives, (3) benzene ring cleavage of these hydroxynitrobenzenes, which produces lower molecular weight carboxylic acids and aldehydes, and (4) further photooxidation, which eventually converts the lower molecular weight acids and aldehydes to CO_2, H_2O, and HNO_3.

30613 **Oxygen depletion in the New York apex: causes and consequences.** Segar, D.A.; Berberian, G.A. (Atlantic Oceanographic and Meteorological Labs., Miami, FL). *Special Symposia - American Society of Limnology and Oceanography;* 632-651(1976). Contract AC02-76CH00016.

Dissolved oxygen concentrations in water of the New York Bight apex are near saturation except in summer when a stable thermocline exists and concentrations in the lower layer can drop to 10% of saturation. Mass balances of oxygen and carbon cycles in the apex were examined. Photosynthetically produced carbon accounts for most of the oxygen demand, particularly in summer. Oxygen demand due to sewage sludge and dredge spoils is small compared to that from organic carbon produced in situ. Oxygen demand of particulate and dissolved organics in the estuarine discharge may be as great as the sewage sludge and dredge spoils together. Midsummer primary productivity in the apex is high due to nutrient inputs, particularly nitrogen. Most nitrogen, supplied to the apex in forms suitable to support photosynthetic production, comes from the discharge of the Hudson-Raritan-Passaic systems. Most of this nitrogen comes from liquid effluents of sewage treatment plants discharged to the rivers. Ocean dumping in the bight apex does not cause the low oxygen concentrations found in summer These are caused primarily by nitrogen supply from rivers. Improvement in dissolved oxygen concentrations could be achieved by removing nitrogen from sewage treatment plant effluents. 32 references, 20 figures, 1 table.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 29198, 29422, 29430, 29444, 30586, 30690, 30740, 30745, 30760

30614 (EPRI-EA—4438, pp 3.1-3.20) **Using aquatic simulation models for impact assessment: evaluation of monitoring programs.** Swartzman, G.L.; McKenzie, D.H.; Kaluzny, S.; Harty, R. (Univ. of Washington, Seattle). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

This paper focuses on a newly developed technique for using simulation models to evaluate the ability of a monitoring program to detect impacts of a given magnitude. Basically, the method uses a complex simulation model as if it were the real system and applies sampling programs of various frequencies to model output to ascertain the probability that the program will encounter a given sized impact (i.e. a difference in the chosen biota between the impacted region and a control region) once, twice, etc. These probabilities are then combined with power curves for detection of given sized impact, given that the impact actually exists, as a function of the number of replicates in each sample. These power curves are estimated from data for the site, biota, and measurement method used in the monitoring program. For the technique to be applicable, the coefficient of variation in the data must be approximately constant and independent of the season of measurement. Also a relatively long data record of driving variables must be available to provide a long enough model run from which to obtain reasonable estimates of the probability of encountering a given sized impact (e.g. 2 to 3 years for most of the applications the authors are considering). The technique is illustrated using a model LAKONT calibrated to monitoring data on Lake Ontario collected in the neighborhood of the Nine Mile Point and Fitzpatrick nuclear power stations. The time period used is 1976 to 1978. 24 references, 2 figures, 4 tables.

30615 (EPRI-EA—4438, pp 3.21-3.40) **Stochastic models for predicting environmental impact in aquatic ecosystems.** Stewart-Oaten, A. (Univ. of California, Santa Barbara). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920216. (CONF-8304100—).

From EPRI workshop on risk assessment in aquatic systems; Albuquerque, NM, USA (13 Apr 1983).

The purpose of stochastic predictions are discussed in relation to the environmental impacts of nuclear power plants on aquatic ecosystems. One purpose is to aid in making rational decisions about whether a power plant should be built, where, and how it should be designed. The other purpose is to check on the models themselves in the light of what eventually happens. The author discusses the role or statistical decision theory in the decision-making problem. Various types of stochastic models and their problems are presented. In addition some suggestions are made for generating usable stochastic models, and checking and improving on them. 12 references.

30616 **(RHO-RE-SA—116-P) Characterization and anion exchange removal of uranium from Hanford ground water.** Delegard, C.H.; Kimura, R.T.; Law. A.G.; Routson, R.C.; Weiss, R.L. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Apr 1986. Contract AC06-77RL01030. 24p. (CONF-860317—44). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009591.

From Waste management '86; Tucson, AZ, USA (2 Mar 1986).

In February 1985, uranium concentrations increased abruptly to 0.1 kg uranium/m^3 in ground waters underlying a retired liquid waste disposal facility in the US Department of Energy-Richland Operations Hanford Site. Characterization tests showed the uranium was present as an anionic carbonate complex that was not sorbable by the Hanford Site sediments. The uranium was mobilized by flow from a perched zone of water, which was caused by recent nearby cooling water disposal above an impermeable sediment layer. In a unique demonstration of the as low as reasonably achievable (ALARA) concept, efforts were immediately undertak-

en to minimize the spread of the plume and to reduce the amount of uranium in the ground water. An anion exchange-based uranium removal process flowsheet was rapidly developed and implemented. The process has been operational for six months and has treated over 30,000 m^3 of ground water and collected 94% of the uranium while producing a treated effluent that meets criteria for discharge to the soil column.

30617 **(RHO-RE-SR—85-24-P) Results of the separations area ground-water monitoring network for 1984.** Law, A.G.; Schatz, A.L.; Fuchs, M.R.; Dillon, K.L. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jan 1986. Contract AC06-77RL01030. 143p. NTIS, PC A07/MF A01; 1; GPO Dep. File Number DE86009175.

The purpose of this report is to present a summary of the results for calendar year 1984 of the Rockwell Hanford Operations (Rockwell) groundwater monitoring program for the Separations Area of the Hanford Site. This monitoring program is in partial fulfillment of the US Department of Energy (DOE) requirement that all radioactivity in the environment shall be monitored. The objectives of the monitoring program are to (1) evaluate the quality of ground water for compliance with Rockwell and DOE guidelines, (2) assess the performance of disposal and storage sites in the Separations Area, (3) determine the impact of waste disposal operations on the ground water, and (4) provide data for hydrologic analyses and model application. The 1984 Separations Area unconfined aquifer monitoring network included 127 wells. Water samples were collected monthly, quarterly, or semiannually from the wells in the network. These samples were selectively analyzed for total alpha, total beta, tritium, ^{90}Sr, ^{137}Cs, ^{60}Co, ^{106}Ru, uranium and nitrate. Average radionuclide concentrations in monitoring wells for 1984 were similar to 1983. Water levels were measured in 224 wells to produce water table maps of the Separations Area (annually) and of the Hanford Site (semiannually). 20 refs., 22 figs., 25 tabs.

30618 **Distribution of plutonium and americium beneath a 33-year-old liquid waste disposal site.** Nyhan, J.W.; Drennon, B.J.; Abeele, W.V.; Wheeler, M.L.; Purtymun, W.D.; Trujillo, G.; Herrera, W.J.; Booth, J.W. *Journal of Environmental Quality;* **14**: No. 4, 501-509(Oct-Dec 1985). Contract W-7405-ENG-36.

The distribution of Pu, ^{241}Am, and water in Bandelier Tuff beneath a former liquid waste disposal site at Los Alamos was investigated. The waste use history of the site was described, as well as the previous field and laboratory studies of radionuclide migration performed at this site. One of the absorption beds studied had 20.5 m of water added to it in 1961 in an aggressive attempt to change the distribution of radionuclides in the tuff beneath the bed. Plutonium and ^{241}Am were detected to sampling depths of 30 m in this bed, but only found to depths of 6.5 to 13.41 m in an adjacent absorption bed (bed 2) not receiving additional water in 1961. After 17 yr of migration of the slug water added to bed 1, 0.3 to 5.1% of the Pu inventory and 3.0 to 49.6% of the ^{241}Am inventory was mobilized within the 30-m sampling depth, as less than one column volume of water moved through the tuff profile under the bed. The results of similar lab and field studies performed since 1953 were compared with our 1978 data and site hydrologic data was used as a time marker to estimate how fast radionuclide migration occurred in the tuff beneath absorption bed 1. Most of the radionuclide migration appeared to have occurred within 1 yr of the 20.5-m water leaching in 1961. 16 references, 2 figures, 4 tables.

30619 **Plutonium and radiocesium in the water column of the Hudson River Estuary.** Linsalata, P.; Simpson, H.J.; Olsen, C.R.; Cohen, N.; Trier, R.M. (New York Univ. Medical Center, Tuxedo). *Environmental Geology and Water Sciences;* **7**: No. 4, 193-204(Spr-Sum 1985).

Isotopes of plutonium (Pu), cesium (Cs), and cobalt (Co) introduced into the Hudson River Estuary from fallout deposition, the erosion of fallout-contaminated surface soils, and nuclear reactor effluent (isotopes of Cs and Co only) have been measured in water column samples collected from 1975 to 1980. The major conclusions drawn from the work are that: for water samples collected by the two laboratories over similar time periods, the mean concentrations of nonfilterable /sup 239,240/Pu (<0.45 μm) were identical at 0.13 fCi/l; mean concentrations of both ^{137}Cs and /sup 239,240/Pu in suspended particulates were more divergent at 2270 +/- 920 pCi/kg (+/- 1 SD) and 1430 +/- 430 pCi/kg for ^{137}Cs, and 19 +/- 8 pCi/kg and 12 +/- 4 pCi/kg for /sup 239,240/Pu. The behavior of /sup 239,240/Pu and ^{137}Cs within the water column is shown to diverge within brackish waters. Specifically, the magnitude of the ^{137}Cs distribution-coefficient (K/sub d/) can be expressed as an inverse power function of the chloride ion concentrations for chlorinities between 0.1 and 4 g Cl^-/l. No difference in the /sup 239,240/Pu k/sub d/ has been observed between fresh and brackish waters. Based on the expected inventories of /sup 239,240/Pu and ^{137}Cs within watershed soils, the current downstream transport of these radionuclides represents fractional mobilization rates on the order of 1-4 (x 10^{-4}) per year.

5204 Thermal Effluents Monitoring And Transport

30620 **(DP-MS—85-120) Vegetational stress detection in a southeastern swamp floodplain using remote sensing and in-situ spectral measurements.** Jensen, J.R.; Hale, A.; Mackey, H.E. Jr. (South Carolina Univ., Columbia (USA). Dept. of Geography; Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1986. Contract AC09-76SR00001. 43p. (CONF-8603101—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008900.

From Freshwater wetlands and wildlife symposium; Charleston, SC, USA (24 Mar 1986).

Both ground level spectral (in situ) and airborne multi-spectral data were gathered for a cypress/tupelo swamp forest in April and May of 1984 to determine if stress could be detected in this wetlands environment. The study sites were adjacent to Stave Island (control site) and to the Pen Branch area (stress site). Both sites are located within a portion of an extensive floodplain along the Savannah River in south-central South Carolina. The Pen Branch site has received cooling water effluent from an operating reactor at the Savannah River Plant for the past 30 years. The mean reflectance values from the in situ measurements of the stressed versus control stands of cypress revealed that three spectral bands (0.52 to 0.60 μm, green; 0.63 to 0.69 μm, red; and 0.79 to 0.90 μm, near-infrared) were significantly different at the 95 percent confidence level, and could be used to differentiate the stands. Three similar spectral bands (0.55 to 0.60 μm, green; 0.65 to 0.70 μm, red; and 0.91 to 1.10 μm, near-infrared) were selected for analyses from the airborne multispectral scanner data collected at 2440 meters (8000 feet). Analyses of these data also indicated that significantly different spectral signatures were present in stands of cypress bordering the Pen Branch site, when compared to the spectral data from the control sites near Stave Island.

5205 Site Resource And Use Studies

30621 **(DOE/BP/33825—1) Biological and physical inventory of the streams within the Nez Perce Reservation. Synopsis of three years of stream inventory on the Nez Perce Reservation. Final report 1985.** Fuller, R.K.; Kucera, P.A.; Johnson, D.B. (Nez Perce Tribe, Lapwai, ID (USA). Fisheries Resource Management). Aug 1985. Contract AI79-82BP33825. 155p. NTIS, PC A08/MF A01; 1; GPO Dep. File Number DE86008828.

This report provides a synopsis for three years of inventory work on the streams in the Lower Clearwater Basin, Idaho. The main emphasis of the study was to document which streams presently support anadromous salmonids, the extent of production in those streams and the identification of those streams which may best respond to enhancement restoration activities. Rainbow-steelhead trout (Salmo gairdneri) were the most abundant anadromous salmonid found. Chinook salmon (Oncorhynchus tshawytscha) were found rarely except in the Lolo Creek Drainage. The main environmental problem affecting these streams was the extreme flow variations which commonly occur. This is due primarily to poor land management practices. Enhancement recommendations are suggested for these streams which include passage around barriers, barrier removal, riparian enhancement, instream habitat improvement, and better land use practices.

5206 Regulations

REFER ALSO TO CITATION(S) 29331

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

REFER ALSO TO CITATION(S) 29906

5301 Social And Economic Studies

30622 **Local taxation and the consequences of revenue distribution patterns.** Jones, D.W.; Morrow-Jones, C.R. (Oak Ridge National Lab., TN). *Regional Science and Urban Economics;* **14**: 63-76(1984).

The economy of a small region is modeled as an eighteen-equation system describing production, consumption, income distribution, factor supply, and a government sector. The government uses independent taxes on land rents and capital rentals to collect revenue equal to 20% of what land rents would be in an untaxed equilibrium and distributes the revenue to local residents in four different patterns. The distribution of the tax revenue, as well as the mobility of the factor taxed, generates distinct patterns of impacts on regional population, capital stock and production structure, wages, rents, and the incidence of the taxes. 23 references, 7 tables.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

REFER ALSO TO CITATION(S) 30575

5502 Biochemistry

REFER ALSO TO CITATION(S) 29247, 29503, 30275

30623 (CSIR-SR-CHEM—267, pp 65-104) **Molecular biochemistry.** 1985. (In Afrikaans). NTIS (US Sales Only), PC A09/MF A01. File Number DE86780436.

In Annual report 1985.

Structural studies were done on snake poison. The order of the amino acids of this protein was determined, as well as the effect of snake poison cardiotoxin on red blood cells; and the preparation of antibodies. Hydrogen 1 nmr spectra was used to determine the chemical structure of the proteins and toxins.

30624 (EPRI-AP—4431, pp 3.117-3.147) **NO/sub x/ control efforts increase.** Lynch, C.E. (United Illuminating Co., New Haven, CT). Feb 1986. Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920146. (CONF-8506250—).

From EPRI fuel oil utilization workshop; Atlanta, GA, USA (19 Jun 1985).

During 1982 and 1983, some utilities burning residual fuel oil found their units, that were once in compliance in NO/sub x/ emission levels, were no longer able to meet the requirements. One utility's efforts to get two different types of units back into compliance is discussed here. These efforts included testing by the utility, the boiler manufacturer, consultants, operating modifications, equipment modifications, and outages to wash the boiler. 4 figures, 12 tables.

30625 **ESR and ENDOR of bacteriopheophytin a radicals. Implications for bacteriochlorophylls in vivo.** Horning, T.L.; Fujita, E.; Fajer, J. (Brookhaven National Lab., Upton, NY). *Journal of the American Chemical Society;* **108**: No. 2, 323-325(22 Jan 1986). Contract AC02-76CH00016.

The model studies presented here seek to probe effects that the protein environment may induce or impose on the conformation and electronic configuration of photosynthetic chromophores. The cation radicals observed on photooxidation of bacterial reaction centers have been assigned previously to dimeric bacteriochlorophylls (BChl) a or b on the basis of comparisons of ESR and ENDOR characteristics in vivo with those observed for $BChl^+$ a and b in vitro. Recent X-ray results of the Rhodopseudomonas viridis reaction center (BChl b) support the dimer formulation for its unoxidized primary donor, P960, and provide evidence of possible interactions between the magnesium and the oxygen of a nearby 2-acetyl group, as well as of ligation by neighboring protein residues. Chlorophylls further interact with their environment by hydrogen bonding of their peripheral carbonyl groups, as evidenced by resonance Raman data. To separate ligation and/or hydrogen bonding effects from the intrinsic unpaired spin distributions of BChl radicals, the ENDOR parameters of the cation radical of bacteriopheophytin a (BPheo, a demetalated BChl) have been measured as a function of solvent and temperature. 19 references, 2 figures, 1 table.

30626 **Test of a theory relating to the cross-linking of IgE antibody on the surface of human basophils.** MacGlashan, D.W. Jr.; Dembo, M.; Goldstein, B. (Johns Hopkins Univ., Baltimore, MD). *Journal of Immunology;* **135**: No. 6, 4129-4134(Dec 1985).

Recent mathematical models of bivalent hapten-induced histamine release from basophils predict that under appropriate conditions histamine release is maximum when cross-link formation is maximum, at a hapten concentration equal to 1/(2K/sub a/), where K/sub a/ is the average affinity constant of the hapten for a single IgE binding site. To test this prediction the authors sensitized human basophils with a monoclonal anti-dinitrophenol IgE and generated histamine release dose-response curves with a bivalent hapten, α,ϵ-DNP-lysine. The monoclonal IgE has a published affinity constant of $7.1 \times 10^7\ M^{-1}$ for ϵ-DNP-lysine as determined by equilibrium dialysis. From the position of the maximum of the histamine dose-response curves, both in the presence and in the absence of monovalent DNP hapten, the authors determine that the sensitizing IgE has an intrinsic affinity constant of $6.9 \pm 0.5 \times 10^7\ M^{-1}$ for ϵ-DNP-lysine and $1.2 \pm 0.6 \times 10^6\ M^{-1}$ for α-DNP-lysine. The agreement between the two estimates of the ϵ-DNP-lysine affinity constant, one from histamine release experiments involving surface bound IgE and one from binding experiments involving IgE free in solution, 1) is consistent with a central prediction of the theory of cross-linking and 2) indicates that the hapten-binding properties of the IgE are unaffected by its being bound to Fc/sub ϵ/ receptors on the basophil surface. 30 references, 3 figures, 3 tables.

30627 **Alterations in growth, photosynthesis, and respiration in a starchless mutant of Arabidopsis thaliana (L.) deficient in chloroplast phosphoglucomutase activity.** Caspar, T.; Huber, S.C.; Somerville, C. (Michigan State Univ., East Lansing). *Plant Physiology;* **79**: No. 1, 11-17(Sep 1985). Contract AC02-76ER01338.

A mutant of Arabidopsis thaliana (L.) Heynh. which lacks leaf starch was isolated by screening for plants which did not stain with iodine. When grown in a 12-h photoperiod, leaves of the wild-type accumulated substantial amounts of starch but lower levels of soluble sugars. Under these conditions, the mutant accumulated relatively high levels of soluble sugars. Rates of growth and net photosynthesis of the mutant and wild-type were indistinguishable when the plants were grown in constant illumination. However, in a short photoperiod, the growth of the mutant was severely impaired, the rate of photosynthesis was depressed relative to the wild-type, and the rate of dark respiration, which was high following the onset of darkness, exhibited an uncharacteristic decay throughout the dark period. The depressed photosynthetic capacity of the mutant may also reflect a metabolic adaptation to the accumulation of high levels of soluble carbohydrate which mimics the effects of alterations in source/sink ratio. The activities of sucrose phosphate synthase and acid invertase are significantly higher in the mutant than in the wild-type whereas ADP-glucose pyrophosphorylase activity is lower. This suggests that the activities of these enzymes may be modulated in response to metabolite concentrations or flux through the pathways.

30628 Pyruvate decarboxylase from Zea mays L. Lee, T.C.; Langston-Unkefer, P.J. (Univ. of Wisconsin, Madison). *Plant Physiology;* 79: No. 1, 242-247(Sep 1985).

Pyruvate decarboxylase (PDC) was purified from mature, dry maize kernels and from roots of anaerobically treated maize seedlings and partially characterized. PDC was purified to a specific activity of 96 units per milligram protein from kernels and to 41 units per milligram protein from root. The subunit molecular masses were estimated to be 61,000 and 60,000 for kernel PDC and 59,000 and 58,000 for root PDC. The pH optimum for each enzyme was 5.8. Since the pH optimum is nearly one pH unit below the value reported for the cytoplasm of anaerobically metabolizing maize roots, the authors investigated the effects of pH 5.8 and 6.6 on the cooperative kinetics observed for PDC from each source. The maximum Hill coefficients (NH) were much greater at each pH for the kernel PDC than for the root PDC. The cooperative kinetics observed with respect to pyruvate were asymmetric. Potassium inhibited maize PDC and was competitive with pyruvate. 25 references, 6 figures, 4 tables.

30629 Synthesis and uptake of cytoplasmically synthesized pyruvate, Pi dikinase polypeptide by chloroplasts. Aoyagi, K.; Bassham, J.A. (Lawrence Berkeley Lab., CA). *Plant Physiology;* 78: No. 4, 807-811(Aug 1985). Contract AC03-76SF00098.

Polyadenylated RNA was isolated from maize leaves and translated in vitro. In agreement with a previous report by others, the authors found among the translation products a 110-kilodalton pyruvate orthophosphate dikinase (PPDK) precursor that is about 16 kilodaltons larger than the polypeptide isolated from cells. This maize PPDK precursor polypeptide was taken up from the translation product mixture by intact spinach chloroplasts and yielded a mature PPDK polypeptide (94 kilodaltons). The uptake and processing support the proposal that the extra 16-kilodalton size of the polypeptide from in vitro translation of maize leaf mRNA represents a transit sequence which is cleaved after its entry into chloroplasts. Moreover, these results provide additional evidence that in vivo in maize leaf cells PPDK polypeptide is synthesized in the cytoplasm and is transported into the chloroplasts. Location of PPDK in C_3 plant leaves was investigated by immunochemical analysis. A protein blot of stromal protein in each case gave rise to bands corresponding to authentic PPDK polypeptide. This result indicates that PPDK is present in chloroplasts of C_3 plant leaves as it is in the case of C_4 plants. 35 references, 3 figures.

30630 Analysis of photosynthetic antenna function in a mutant of Arabidopsis thaliana (L.) lacking trans-hexadecenoic acid. McCourt, P.; Browse, J.; Watson, J.; Arntzen, C.J.; Somerville, C.R. (Michigan State Univ., East Lansing). *Plant Physiology;* 78: No. 4, 853-858(Aug 1985). Contract AC02-76ER01338.

Several lines of evidence support the proposal that the unusual chloroplast-specific lipid acyl group Δ3, trans-hexadecenoic acid (trans-C/sub 16:1/) stimulates the formation or maintenance of the oligomeric form of the light-harvesting chlorophyll a/b complex (LHCP). To assess the functional significance of this apparent association the authors have analyzed LHCP structure and function in a mutant of Arabidopsis thaliana (L.) which lacks trans-C/sub 16:1/ by electrophoretic analysis of the protein-chlorophyll complexes and by measurements of chlorophyll fluorescence under a variety of conditions. By these criteria the putative oligomeric form of LHCP appears to be slightly more labile to detergent-mediated dissociation in the mutant. The oligomeric PSI chlorophyll-protein complex, associated with PSI, was also more labile to detergent-mediated dissociation in the mutant, suggesting a previously unsuspected association of trans-C/sub 16:1/ with the PSI complex. The role of trans-C/sub 16:1/ is very subtle or is only conditionally expressed. 28 references, 6 figures.

30631 Stable-carbon isotopic composition of maple sap and foliage. Leavitt, S.W.; Long, A. (Univ. of Wisconsin-Parkside, Kenosha). *Plant Physiology;* 78: No. 2, 427-429(Jul 1985). Contract AC05-84OR21400.

The $^{13}C/^{12}C$ ratios of Acer grandidentatum sap sugar collected during the dormant period are compared to those of buds, leaves, and wood developed over the following growing season. As the primary carbon source for cellulose manufacture at initiation of annual growth in deciduous trees, sap sucrose would be expected to have an isotopic composition similar to first-formed cellulose. Although constancy in concentration and $^{13}C/^{12}C$ ratios of the maple sap sugar suggests any gains or losses (e.g. to maintenance metabolism) do not appreciably alter composition, the $^{13}C/^{12}C$ ratios of cellulose of the enlarging buds in the spring are quite distinct from those of the sap sugar, seemingly precluding a simple direct biochemical pathway of sap sucrose-glucose-cellulose in favor of a more complex pathway with greater likelihood of isotopic fractionation. The $^{13}C/^{12}C$ ratios of the the leaves and in the growth ring were initially similar to the sap sugar but decreased steadily over the growing season.

30632 Weak neutral currents and the origin of biomolecular chirality. Kondepudi, D.K.; Nelson, G.W. (Univ. of Texas, Austin). *Nature (London);* 314: No. 6010, 438-441(4 Apr 1985). Contract AS05-81ER10947.

It has long been known that Earth's biochemistry is overwhelmingly dissymmetric or chiral. In model chemical systems that spontaneously evolve to a state dominated by either the L or the D enantiomer, parity violation in β-decay and that attributable to weak neutral currents (WNC) in molecules is thought to be too small to have any significant influence on the emergent chirality. Other conceivable systematic chiral influences are generally even weaker. It is shown here that there is a simple and extremely sensitive mechanism by which a minute but systematic chiral interaction, no stronger than the WNC interaction in amino acids, can, over a period of ~15,000 yr, determine which enantiomer will dominate. Such a mechanism is especially interesting when considering the origins of terrestrial biochemistry, particularly in view of the work by Mason and Tranter, who found that it is the terrestrially dominant L amino acids that are favored by the WNC interaction. 35 references, 2 figures.

30633 Reduced apparent photorespiration by the C_3-C_4 intermediate species, Moricandia arvensis and Panicum milioides. Holbrook, G.P.; Jordan, D.B.; Chollet, R. (Univ. of Nebraska, Lincoln). *Plant Physiology;* 77: No. 3, 578-583(Mar 1985). Contract AC02-81ER10902;FG02-84ER13215.

The CO_2/O_2 specificity factor of sucrose gradient purified ribulose 1,5-bisphosphate carboxylase/oxygenase from the C_3-C_4 intermediate plants Moricandia arvensis and Panicum milioides was similar to the respective values of the enzyme from the closely related C_3 species, Moricandia foetida and Panicum laxum. Thus, the kinetic properties of this bifunctional enzyme do not explain the reduced rates of photorespiration exhibited by either of these intermediate species. Dark/light ratios for aminoacetonitrile-sensitive $^{14}CO_2$ evolution during decarboxylation of exogenous [1-^{14}C] glycine by leaf discs had values of 9.0 with M. arvensis and 11.8 with P. milioides. Similar results were obtained using [1-^{14}C] glycolate as the exogenous photorespiratory substrate, with dark/light $^{14}CO_2$ evolution ratios for the C_3-C_4 and C_3 leaf discs averaging 6.6 and 2.0, respectively. The data suggest that P. milioides and M. arvensis are capable of a more efficient internal recycling of photorespiratory CO_2 via ribulose bisphosphate carboxylase/oxygenase than closely related C_3 plants, and that this may partially account for the reduced rates of apparent photorespiration by these intermediate species.

30634 Histochemical technique: a general method for quantitative enzyme assays of single cell extracts with a time resolution of seconds and a reading precision of femtomoles. Outlaw, W.H. Jr.; Springer, S.A.; Tarczynski, M.C. (Florida State Univ., Tallahassee). *Plant Physiology;* 77: No. 3, 659-666(Mar 1985).

Biochemists who study single cells have been constrained by the lack of a general methodology of high time resolution and high measurement sensitivity for quantitatively assaying enzyme activities using natural substrates in solution. The methods the authors describe will remove this limitation. In brief, nanogram tissue samples are dissected from frozen-dried tissue. The samples are extracted in microdroplets of assay cocktail. The enzyme activity, indicated fluorometrically by the oxidation/reduction of NAD(P), is followed in real time on a computer display. With these methods,

assays of pyruvate orthophosphate dikinase on samples enriched in bundlesheath cells and mesophyll cells of Flaveria brownii yielded the predictable results. Assays of this enzyme in guard cells dissected from Vicia faba leaflets gave results like those recently reported by another laboratory for protoplasts derived from these cells. The results of assays by this method and by enzymic cycling for NAD(P) triose-P dehydrogenase were comparable. Phosphoenolpyruvate carboxylase, the most extensively studied enzyme activity, was present at high levels in guard cells, which has been demonstrated previously in other reports based on diverse assay approaches.

30635 **Comparison of chromatographic characteristics of a series of homologous Bence-Jones proteins during size-exclusion chromatography by high-performance liquid chromatography and by Sephadex.** Short, M.T.; Westholm, F.A.; Schiffer, M.; Stevens, F.J. (Argonne National Lab., IL). *Journal of Chromatography;* 323: 418-423(1985). Contract W-31-109-ENG-38.

High-performance liquid chromatography has become popular for protein purification and analysis as a consequence of its high resolution capability. Most commonly, protein separations are effected by combined ion exchange and hydrophobic interactions between the protein and the chromatographic matrix. However, the presence of such interaction has impaired the suitability of most porous HPLC matrices for size-exclusion protein fractionation on the basis of molecular weight. Size-exclusion chromatography, which is commonly used for protein purification and molecular weight estimation, has also provided a means to study reversible interactions between proteins. However, analytical interpretation of these experiments requires minimal non-specific interaction between protein and matrix, as is typically the case with polysaccharide or polymerized agarose gels. The authors have previously described the use of small zone gel filtration of immunoglobulin light chains (Bence-Jones proteins) to observe the interactions between these polypeptide chains. Here the authors report the results of similar experiments with these proteins in which they used a commercially available HPLC matrix designed for separation of proteins on the basis of molecular weight.

30636 **Effect of preferential insertion of LDL receptors near coated pits.** Wofsy, C.; Echavarria-Heras, H.; Goldstein, B. (Univ. of New Mexico, Albuquerque). *Cell Biophysics;* 7: 197-204(1985).

Recent experiments suggest that low density lipoprotein (LDL) receptors on human fibroblasts are not inserted into the plasma membrane uniformly, as earlier experiments indicated, but are inserted into specialized regions, called plaques, where coated pits form. If the consequent reduction in the time required for LDL receptors to diffuse to coated pits were significant, this could alter conclusions drawn from previous calculations based on the assumption that LDL receptors are inserted uniformly. In particular, the conclusion could be wrong that diffusion of LDL receptors to coated pits is the rate limiting step in the interaction of cell surface LDL receptors with coated pits. Here the authors calculate the extent of the reduction in mean travel time of an LDL receptor to a coated pit, as a function of the plaque radius. The authors find that only if LDL receptor insertion is limited to a very small portion of the plasma membrane near coated pit sites is there a substantial decrease in the average time it would take an LDL receptor to diffuse to a coated pit. In order for preferential insertion of LDL receptors into plaques to cut the mean receptor travel time in half, plaques would have to take up no more than 10% of the cell surface area; to reduce the travel time by a factor of 10, plaques would have to cover only 2% of the cell surface, approximately twice the area covered by coated pits at 37°C. 17 references, 2 figures.

30637 **[Mesityl]bacteriorhodopsin. The properties of an analogue of the purple membrane containing [mesityl]retinal as the chromophore.** Sonnewald, U.; Seltzer, S.; Robinson, A.E.; Packer, L. (Brookhaven National Lab., Upton, NY). *Photochemistry and Photobiology;* 41: No. 3, 303-307(1985). Contract AC02-76CH00016.

A new synthesis of all-trans-[mesityl]retinal, II, (all-trans-3,7-dimethyl-9-(2',4',6'-trimethylphenyl)-2,4,6,8,-nonatetraenal) and 13-cis-[mesityl]retinal, VI, (3,7-dimethyl-9-(2'4'6'-trimethylphenyl)-2Z,4E,6E,8E-nonatetraenal) is reported. Combination of all-trans-[mesityl]retinal with bacteriorhodopsin results in the formation of a synthetic membrane (λ/sub max/ 460) which has photocycling properties similar to the purple membrane although its cycling rate is very much slower. An M-type intermediate can be trapped at -60°C. Photoreversal of the M-intermediate to the wavelength of initial absorption is observed. Phototransformation of the initial [mesityl]bacteriorhodopsin is accompanied by conversion of the all-trans to the 13-cis-isomer. 18 references, 3 figures.

30638 **2-(4-bromoacetamido)anilino-2-deoxypentitol 1,5-bisphosphate, a new affinity label for ribulose bisphosphate carboxylase/oxygenase from Rhodospirillum rubrum: determination of reaction parameters and characterization of an active site peptide.** Herndon, C.S.; Hartman, F.C. (Oak Ridge National Lab., TN). *Journal of Biological Chemistry;* 259: No. 5, 3102-3110(10 Mar 1984). Contract W-7405-ENG-26.

Reductive amination of ribulose-P_2 with p-phenylenediamine in the presence of sodium cyanoborohydride yielded an epimeric mixture which was resolved by chromatography. Subsequent bromoacetylation of the isolated amino bisphosphates gave reagents A and B (ribo and arabino epimers of 2-(4-bromoacetamido)anilino-2-deoxypentitol 1.5-bisphosphate) which were competitive inhibitors of the carboxylase with K/sub i/ values of 705 and 104 μM, respectively. Reagent A exhibited no time-dependent effects on the carboxylase in either the deactivated or activated state. Incubation of the enzyme with reagent B in the presence of the essential activators CO_2 and Mg^{2+}, however, resulted in an irreversible, time-dependent loss of activity, with a K/sub inact/ of 125 μM and a minimal half-time of 7.3 min. Covalent incorporation of [^{14}C]reagent B was directly proportional to the loss of activity, with total inactivation correlating with an incorporation of 1.1 mol of reagent/mol of subunit. Inclusion of the competitive inhibitor 2-carboxyribitol 1,5-bisphosphate protected against inactivation with a concomitant reduction in incorporation. Neither reagent affected the activity of spinach carboxylase. Fractionation of [^{14}C]reagent B-modified enzyme on DEAE-cellulose, subsequent to carboxymethylation and tryptic digestion, revealed two major radioactive peaks of approximately equal area. Digestion of each peak with alkaline phosphatase and rechromatography on DEAE-cellulose resulted in pure peptides I and II. The peptides were identical except in the site of labeling: peptide I contained a modified cysteinyl residue while peptide II contained a modified histidyl residue. 60 references, 7 figures, tables.

30639 **Cellular automata in cytoskeletal lattices.** Smith, S.A.; Watt, R.C.; Hameroff, S.R. (Los Alamos National Labs., NM). *Physica D: Nonlinear Phenomena (Amsterdam);* 10D: 168-174(1984).

Cellular automata (CA) activities could mediate biological regulation and information processing via nonlinear electrodynamic effects in cytoskeletal lattice arrays. Frohlich coherent oscillations and other nonlinear mechanisms may effect discrete 10^{-10} to 10^{-11} s interval events which result in dynamic patterns in biolattices such as cylindrical protein polymers: microtubules (MT). Structural geometry and electrostatic forces of MT subunit dipole oscillations suggest neighbor rules among the hexagonally packed protein subunits. Computer simulations using these suggested rules and MT structural geometry demonstrate CA activities including dynamical and stable self-organizing patterns, oscillators, and traveling gliders. CA activities in MT and other cytoskeletal lattices may have important biological regulatory functions. 23 references, 6 figures, 1 table.

30640 **Enzymatic assay for calmodulins based on plant NAD kinase activity.** Harmon, A.C.; Jarrett, H.W.; Cormier, M.J. (Univ. of Georgia, Athens). *Analytical Biochemistry;* 140: 1-11(1984).

NAD kinase with increased sensitivity to calmodulin was purified from pea seedlings (Pisum sativum L., Willet Wonder). Assays for calmodulin based on the activities of NAD kinase, bovine brain cyclic nucleotide phosphodiesterase, and human erythrocyte Ca^{2+}-ATPase were compared for their sensitivities to cal-

modulin and for their abilities to discriminate between calmodulins from different sources. The activities of the three enzymes were determined in the presence of various concentrations of calmodulins from human erythrocyte, bovine brain, sea pansy (Renilla reniformis), mung bean seed (Vigna radiata L. Wilczek), mushroom (Agaricus bisporus), and Tetrahymena pyriformis. The concentrations of calmodulin required for 50% activation of the NAD kinase (K/sub 0.5/) ranged from 0.520 ng/ml for Tetrahymena to 2.20 ng/ml for bovine brain. The A/sub 0.5/ s ranged from 19.6 ng/ml for bovine brain calmodulin to 73.5 ng/ml for mushroom calmodulin for phosphodiesterase activation. The K/sub 0.5/'s for the activation of Ca^{2+}-ATPase ranged from 36.3 ng/mol for erythrocyte calmodulin to 61.7 ng/ml for mushroom calmodulin. NAD kinase was not stimulated by phosphatidylcholine, phosphatidylserine, cardiolipin, or palmitoleic acid in the absence or presence of Ca^{2+}. Palmitic acid had a slightly stimulatory effect in the presence of Ca^{2+} (10% of maximum), but no effect in the absence of Ca^{2+}. Palmitoleic acid inhibited the calmodulin-stimulated activity by 50%. Both the NAD kinase assay and radioimmunoassay were able to detect calmodulin in extracts containing low concentrations of calmodulin. Estimates of calmodulin contents of crude homogenates determined by the NAD kinase assay were consistent with amounts obtained by various purification procedures. 30 references, 1 figure, 4 tables.

30641 **Studies on the nitrate reductase activities of the fruit and the source leaf in pepper.** Achhireddy, N.R.; Beevers, L.; Fletcher, J.S. (Univ. of Oklahoma, Norman). *HortScience;* **18**: No. 6, 903-905(Dec 1983). Contract AS05-80ER10628.

Nitrate reductase (NR) activity (NO_3^- produced in the dark and under anaerobic conditions) of 30-day-old fruit of Capsicum annuum L. was 2.2% that in tissues of a single leaf adjacent to each fruit (33 vs. 1500 nmoles/hr-g fresh weight). The optimal NR activity in one source leaf could only account for about 17% of the fruit's total nitrogen accumulation, while the fruit's own NR activity was almost negligible. Covered and uncovered fruits did not differ significantly in NR activities. 19 references, 1 figure, 1 table.

30642 **Potentiometric titration of Photosystem II fluorescence decay kinetics in spinach chloroplasts.** Karukstis, K.K.; Sauer, K. (Lawrence Berkeley Lab., CA). *Biochimica et Biophysica Acta;* **722**: 364-371(1983). Contract AC03-76SF00098.

The fluorescence yield of chloroplasts reflects the redox state of the electron acceptor of the Photosystem II reaction center, with increasing yield as the acceptor is reduced. Chemical reductive titrations of fluorescence yield in chloroplasts at room temperature indicate two distinct midpoint potentials, suggesting the possibility of Photosystem II electron acceptor homogeneity. A potentionmetric titration of the fluorescence decay kinetics in spinach chloroplasts was carried out using a continuous mode-locked dye laser with low-intensity excitation pulses and a picosecond-resolution single-photon timing system. The oxidized form of the redox mediator 2-hydroxy-1,4-naphthoquinone was found to preferentially quench the fluorescence, causing an anomalous decrease in the apparent midpoint of the high-potential transition. This effect accounts for a significant difference between the midpoint potentials that were observed and some of those previously reported. The selective effect of reduction potentials on particular fluorescence decay components provides useful information about the organization and distribution of the Photosystem II electron acceptor. 28 references, 7 figures, 1 table.

30643 **Similarity of EPR Signal II/sub f/ rise and P-680$^+$ decay kinetics in Tris-washed chloroplast Photosystem II preparations as a function of pH.** Boska, M.; Sauer, K.; Buttner, W.; Babcock, G.T. (Lawrence Berkeley Lab., CA). *Biochimica et Biophysica Acta;* **722**: 327-330(1983). Contract AC03-76SF00098.

The rise time of Signal II/sub f/ and the decay time of P-680$^+$ have been measured kinetically as a function of pH by using EPR. The Photosystem II-enriched preparations which were used as samples were derived from spinach chloroplasts, and they evolved oxygen before Tris washing. The onset kinetics of Signal II/sub f/ are in agreement, within experimental error, with the fast component of the decay of an EPR signal attributable to P-680$^+$. The signal II/sub f/ rise kinetics also show good agreement with published values of the pH dependence of the decay of P-680$^+$ measured optically. These results are consistent with a model where the species Z (or D_1) responsible for Signal II/sub f/ is the immediate electron donor to P-680$^+$ in tris-washed Photosystem II fragments. 20 references, 1 figure, 1 table.

5503 Cytology

REFER ALSO TO CITATION(S) 30668

30644 **Proteins associated with adaptation of cultured tobacco cells to NaCl.** Singh, N.K.; Handa, A.K.; Hasegawa, P.M.; Bressan, R.A. (Purdue Univ., West Lafayette, IN). *Plant Physiology;* **79**: No. 1, 126-137(Sep 1985).

Cultured tobacco cells (Nicotiana tabacum L. cv Wisconsin 38) adapted to grow in medium containing high levels of NaCl or polyethylene glycol (PEG) produce several new or enhanced polypeptide bands on sodium dodecyl sulfate-polyarylamide gel electrophoresis. The intensities of some of the polypeptide bands increase with increasing levels of NaCl adaptation, while the intensities of other polypeptide bands are reduced. Synthesis of 26-kilodalton polypeptide(s) occurs at two different periods during culture growth of NaCl adapted cells. Unadapted cells also incorporate ^{35}S into a 26-kilodalton polypeptide during the later stage of culture growth beginning at midlog phase. The 26-kilodalton polypeptides from adapted and unadapted cells have similar partial proteolysis peptide maps and are immunologically cross-reactive. During adaptation to NaCl, unadapted cells synthesize and accumulate a major 26-kilodalton polypeptide, and the beginning of synthesis corresponds to the period of osmotic adjustment and culture growth. From their results, the authors suggest an involvement of the 26-kilodalton polypeptide in the adaptation of cultured tobacco cells to NaCl and water stress. 38 references, 11 figures, 2 tables.

30645 **Abscisic acid accelerates adaptation of cultured tobacco cells to salt.** LaRosa, P.C.; Handa, A.K.; Hasegawa, P.M.; Bressan, R.A. (Purdue Univ., West Lafayette, IN). *Plant Physiology;* **79**: No. 1, 138-142(Sep 1985). Contract AC02-83ER13109.

Adaptation of tobacco (Nicotiana tabacum L. var Wisconsin 38) cells to NaCl was accelerated by (+/-) abscisic acid (ABA). In medium with 10 grams per liter NaCl, ABA stimulated the growth of cells not grown in medium with NaCl (unadapted, S-0) with an increasing response from 10^{-8} to 10^{-4} molar. ABA (10^{-5} molar) enhanced the growth of unadapted cells in medium with 6 to 22 grams per liter NaCl but did not increase the growth of cells previously adapted to either 10 (S-10) or 25 (S-25) grams per liter NaCl unless the cells were inoculated into medium with a level of NaCl higher than the level to which the cells were adapted. The growth of unadapted cells in medium with Na_2SO_4 (85.5 millimolar), KCl (85.5 or 171 millimolar), K_2SO_4 (85.5 millimolar) was also stimulated by ABA. These results suggest that ABA is involved in adaptation of cells to salts, and is not effective in promoting adaptation to water deficits elicited by nonionic osmotic solutes. 32 references, 4 figures, 3 tables.

30646 **Characterization of subsets of bone marrow-derived macrophages by flow cytometry analysis.** Walker, E.B.; Akporiaye, E.T.; Warner, N.L.; Stewart, C.C. (Los Alamos National Lab., NM). *Journal of Leukocyte Biology;* **37**: 121-136(1985).

Normal C3H bone marrow cells were grown 7 days in medium containing L cell-derived colony stimulating factor-1 (CSF-1). During the first 4 days of culture, erythroid and granulocytic cells decreased while macrophages increased exponentially with a doubling time of about 31 hr. Only 0.3% of all cells in the initial bone marrrow suspension formed discrete colonies of mononuclear phagocytes, but by day 6 60% of the nonadherent cells were capable of forming macrophage colonies, representing a 200-fold enrichment of the original progenitor population. Using flow cytometry, mononuclear phagocytes obtained after 4 days of culture were separated into two distinct phenotypes based on their autofluorescence. Nonadherent cells were a discrete population of small cells exhibiting low autofluorescence, and the adherent cells were a broad heterogenous population of large cells exhibiting high

autofluorescence. A panel of currently available rat monoclonal antibodies (MABs) against murine hematopoietic cells were used to determine whether unique subsets of macrophages could be resolved. The MABs RA 31B6 and H-11 stained virtually all the nonadherent cells but not adherent cells. The MABs E-2 and 11-4.1 (anti-H-2K/sup k/) stained almost all the adherent cells and demonstrated no significant staining of nonadherent cells. Nearly all the nonadherent and adherent cells were stained by the MABs DNL 4.4 and MAC-1. Additionally, the data suggest that the epitopes for MAC-2 and MAC-3 and γ2a Fc receptors develop late in nonadherent progenitor cells as they mature into adherent macrophages. 37 references, 5 figures, 5 tables.

30647 **Preparation and bivariate analysis of suspensions of human chromosomes.** van den Engh, G.J.; Trask, B.J.; Gray, J.W.; Langlois, R.G.; Yu, L.C. (Erasmus Univ., Rotterdam, Netherlands). *Cytometry (Baltimore);* 6: 92-100(1985). Contract W-7405-ENG-48.

Chromosomes were isolated from a variety of human cell types using a HEPES-buffered hypotonic solution (pH 8.0) containing KCl, $MgSO_4$ dithioerythritol, and RNase. The chromosomes isolated by this procedure could be stained with a variety of fluorescent stains including propidium iodide, chromomycin A3, and Hoeschst 33258. Addition of sodium citrate to the stained chromosomes was found to improve the total fluorescence resolution. High-quality bivariate Hoeschst vs. chromomycin fluorescence distributions were obtained for chromosomes isolated from a human fibroblast cell strain, a human colon carcinoma cell line, and human peripheral blood lymphocyte cultures. Good flow karyotypes were also obtained from primary amniotic cell cultures. The Hoeschst vs. chromomycin flow karyotypes of a given cell line, made at different times and at dye concentrations varying over fourfold ranges, show little variation in the relative peak positions of the chromosomes. The size of the DNA in chromosomes isolated using this procedure ranges from 20 to 50 kilobases. The described isolation procedure is simple, it yields high-quality flow karyotypes, and it can be used to prepare chromosomes from clinical samples. 22 references, 7 figures, 1 table.

5504 Genetics

REFER ALSO TO CITATION(S) 30722, 30724

30648 **Nuclear and organelle split genes.** Dutta, S.K. (Howard Univ., Washington, DC). pp 219-253 of Advances in chromosome and cell genetics. Sharma, A.K.; Sharma, A. (eds.). New Delhi, India; Oxford & IBH Publishing Co. (1985).

Extensive studies made with split genes showed that those intervening sequences, later known as introns, were not necessarily repeated DNA sequences. In fact, new evidence suggested that introns of some gene were exons of other genes. The introns, which were thought to be non-protein coding, do in fact produce a regulatory protein maturase which is responsible for splicing of mature (or messenger) RNAs. It was postulated that introns could have buffering action against mutational and recombinational accidents. These facts led to the obvious question, what is the origin of introns. To seek answers, molecular biologists turned their attention to detailed studies with organelle genes like those found in mitochondria, or chloroplasts or genes (like extrachromosomal rDNAs) which are found in the cytoplasm. The organelle genes were comparatively easier to clone and to study extensively because of their smaller genome. This study reviews information on split genes published after 1982. This information confirms the almost universal occurrence of split genes, gives procedures for identifying split genes, explains the relative sizes of exons and introns, and discusses some common characteristics, consequences and evolutionary aspects of split genes. 102 references, 10 figures, 5 tables.

30649 **Cytogenetic analysis of bone marrow damage.** Tice, R.R.; Ivett, J.L. (Brookhaven National Lab., Upton, NY). pp 119-140 of Toxicology of the blood and bone marrow. Irons, R.D. (ed.). New York, NY; Raven Press (1985). Contract AC02-76CH00016.

Cytogenetic manifestations of bone marrow damage, whether they be cytotoxic or genotoxic, provide unique opportunity for assessing events on a cell-by-cell basis. These manifestations include: (a) aneuploidy, (b) chromosomal aberrations, (c) micronuclei formation, (d) sister chromatid exchanges, and (e) alterations in cell cycle kinetics. With the exception of micronucleus evaluation, these cytogenetic endpoints require metaphase cells for evaluation, and, unfortunately, metaphase cells are generally not identifiable as to cell lineage. This restriction limits the usefulness of cytogenetic evaluations by not allowing a cell-type specific analysis of the induced response. Micronuclei, which can be selectively analyzed in specific cell types, can be used to assess the genotoxic effect of agents on cells of different lineages. The purpose of this chapter is to discuss the biological basis for these various cytogenetic endpoints and their utility in assessing bone marrow damage. It will also be demonstrated that several of these independent measures of cytotoxic/genotoxic damage can be integrated into one methodology offering increased resolution and sensitivity. 72 references, 4 figures, 5 tables.

30650 **Episomal DNA as a molecular probe of cytoplasmic male sterility in S Zea mays.** Mans, R.J. (Univ. of Florida, Gainesville). pp 263-266 of Maize for biological research. Sheridan, W.F. (ed.). Charlottesville, VA; Plant Molecular Biology Association (1982). Contract AS05-81ER10904.

Discrete DNA molecules isolated from the mitochondria of genetically defined male sterile maize offer a facile entree into the molecular genetics of an agronomically important plant. It has been postulated the presence of a male fertility element that is alternately fixed in the cytoplasm or in the nucleus; i.e., a mobile episome. Molecular evidence for the existence of a fertility episome in maize has come from direct examination of the cytoplasmic components of S cms (cytoplasmic male sterility) plants and through serendipity. It has been confirmed earlier that, of the two known maternally heritable organelles in the cytoplasm of a corn cell, the mitochondrion bore the cms character and not the chloroplast. Reproducible differences have been shown in the restriction endonuclease cleavage products of mitochondrial DNA (mtDNA) for T cms plants. Digests of mt DNA from S cms have shown multiple copies of a few DNA fragments with identically spaced cleavage sites. When undigested S mtDNA was compared electrophoretically with that from fertile or from cms plants other than S, two linear DNA molecules were detected. These linear molecules peculiar to S cms plants are now referred to as S-1 and S-2. The authors studied the fate of S-1 and S-2 sequences in the cytoplasmic revertants in two stages. By Southern blotting mtDNA restriction fragments and hybridizing them with isolated S-1 and S-2 DNAs, the apparent integration of portions of each into fragments unique to the high molecular weight mtDNA of the cytoplasmic revertants was observed. The data showed a correlation between the apparent integration of the S-1 and S-2 sequences into the high molecular weight mtDNA and the plants ability to exert pollen. In the latter experiments, cloned segments of S-1 and S-2 DNAs were used as hybridization probes.

5505 Metabolism

REFER ALSO TO CITATION(S) 29247, 30555, 30661, 30663

30651 **(CONF-8606111—2) Design, synthesis and evaluation of redox radiopharmaceuticals: a potential new approach for the development of brain imaging agents.** Srivastava, P.C.; Knapp, F.F. Jr. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009462.

From 6. international symposium on radiopharmaceutical chemistry; Boston, MA, USA (29 Jun 1986).

The fabrication and complete evaluation are described of a dihydropyridine in equilibrium pyridinium salt type redox system for the delivery of radioiodinated agents to the brain. The pivotal intermediate, N-succinimidyl (1-methylpyridinium iodide)-3-carboxylate was prepared by condensation of nicotinic acid and N-hydroxysuccinimide in the presence of dicyclohexylcarbodimide, followed by quaternization of III with methyl iodide. Tissue distribution studies of ^{125}I-labeled 4-iodoaniline and the redox agents were performed in rats. [^{125}I]Iodoaniline initially showed moderate (0.58% dose/gm) brain uptake with subsequent release of the radio-

activity from the brain. [^{125}I]Iodoaniline, when coupled to a dihydropyridine carrier showed higher uptake and retention in the brain. The [^{125}I]iodophenylethyl analogue showed uptake and retention in the brain to be very similar. Apparently the lipophilic agents cross the blood-brain barrier and are oxidized (quaternized) within the brain. The blood-brain barrier then prevents their release resulting in high uptake and retention in the brain and high brain:blood ratios. 11 refs., 3 figs.

30652 **(CONF-8606111—3) Design, synthesis and evaluation of 2-deoxy-2-iodovinyl-branched carbohydrates as potential brain imaging agents.** Goodman, M.M.; Callahan, A.P.; Knapp, F.F. Jr. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009460.

From 6. international symposium on radiopharmaceutical chemistry; Boston, MA, USA (29 Jun 1986).

Radioiodinated carbohydrates such as 2-deoxy-2-iodo-D-glucose and 3-deoxy-3-iodo-D-glucose undergo facile chemical or in vivo deiodination which precludes their use as radiotracers of glucose metabolism in tissues. To overcome the problems resulting from in vivo deiodination, we explored the concept of stabilizing radioiodide on a model carbohydrate, (E)-C-3-iodovinyl-D-allose (10) as an iodovinyl moiety. This agent did not exhibit brain specificity but showed low in vivo deiodination which demonstrated for the first time that radioiodide can be stabilized on a carbohydrate. The goal of this study was to develop a deoxy-branched carbohydrate with radioiodide stabilized as a vinyliodide with the objective of achieving high brain uptake. 10 refs., 1 fig., 1 tab.

30653 **Fermentative metabolism of Chlamydomonas reinhardtii. II. Role of plastoquinone.** Gfeller, R.P.; Gibbs, M. (Brandeis Univ., Waltham, MA). *Plant Physiology;* 77: No. 2, 509-511(Feb 1985). Contract AC02-76ER03231.

Evidence is presented to substantiate a chloroplastic respiratory pathway in the green alga, Chlamydomonas reinhardtii, whereby reducing equivalents generated during the degradation of starch enter the thylakoidal chain at the plastoquinone site catalyzed by NADH-plastoquinone reductase. In this formulation, the reduced plastoquinone is oxidized either by the photoevolution (photosystem 1) of H_2 under anaerobic conditions or by O_2 during dark respiration.

30654 **Electrothermal atomic absorption spectrophotometry of nickel in tissue homogenates.** Sunderman, F.W. Jr.; Marzouk, A.; Crisostomo, M.C.; Weatherby, D.R. (Univ. of Connecticut School of Medicine, Farmington). *Annals of Clinical Laboratory Science;* 15: No. 1, 299-307(1985).

A method for analysis of Ni concentrations in tissues is described, which involves (a) tissue dissection with metal-free obsidian knives, (b) tissue homogenization in polyethylene bags by use by a Stomacher blender, (c) oxidative digestion with mixed nitric, sulfuric, and perchloric acids, and (d) quantitation of Ni by electrothermal atomic absorption spectrophotometry with Zeeman background correction. The detection limit for Ni in tissues is 10 ng per g, dry weight; the coefficient of variation ranges from 7 to 15%, depending on the tissue Ni concentration; the recovery of Ni added in concentration of 20 ng per g, dry weight, to kidney homogenates averages 101 +/- 8% (mean +/-SD). In control rats, Ni concentrations are highest in lung (102 +/- 39 ng per g, dry weight) and lowest in spleen (35 +/- 16 ng per g, dry wt.). In descending order of Ni concentrations, the tissues of control rats rank as follows: lung > heart > bone > kidney > brain > testis > fat > liver > spleen. In rats killed 24 h after sc injection of $NiCl_2$ (0.125 mmol per kg, body weight) Ni concentrations are highest in kidney (17.7 +/- 2.5 μg per g, dry weight) and lowest in brain (0.38 +/- 0.14 μg per g, dry weight). In descending order of Ni concentrations, the tissues of $NiCl_2$-treated rats rank as follows: kidney >> lung > spleen > testis > heart > fat > liver > bone > brain. The present method fills the need for an accurate, sensitive, and practical technique to determine tissue Ni concentrations, with stringent precautions to minimize Ni contamination during tissue sampling and processing. 35 references, 5 figures, 1 table.

30655 **In vivo studies of pyridine nucleotide metabolism in Escherichia coli and Saccharomyces cerevisiae by carbon-13 NMR spectroscopy.** Unkefer, C.J.; London, R.E. (Los Alamos National Lab., NM). *Journal of Biological Chemistry;* 259: No. 4, 2311-2320(25 Feb 1984).

Pyridine nucleotide metabolism has been studied in vivo in a prokaryotic (Escherichia coli) and a eukaryotic (Saccharomyces cerevisiae) system cultured in a medium containing carbon-13-labeled nicotinic acid, followed by NMR detection of the labeled organisms. Chemical exchange between oxidized and reduced nucleotides is found to be sufficiently slow on the NMR time scale to permit the observation of separate resonances corresponding to each redox state. The possibility of significant exchange broadening of reduced pyridine nucleotide resonances under some conditions was further evaluated based on comparative NMR studies utilizing organisms cultured in the presence of either [2-^{13}C]nicotinate or [5-^{13}C]nicotinate. Based on these experiments, it was concluded that broadening as a consequence of intermediate exchange is not significant. Although it was initially anticipated that the carbon-13 resonances arising from the di- and triphosphopyridine nucleotide pools could not be distinguished, the absence of observable resonances corresponding to reduced nucleotides in oxygenated yeast and E. coli cells suggests that the NMR method is fairly specific for determining the redox status of the diphosphopyridine nucleotide pool. Studies of the effects of a variety of perturbations including variation of the oxygen supply, addition of ethanol, and addition of the oxidative phosphorylation uncoupler dinitrophenol have been carried out. Dramatic differences in the response of the catabolic reduction charge, CRC = [NADH]/[NADH] + [NAD^+], between the yeast and E. coli cells are observed. The CRC values for the yeast undergo large changes in response to these perturbations which are not observed for the bacterial cells. 52 references, 9 figures, 2 tables.

30656 **Influence of shade on the growth and nitrogen assimilation of developing fruits on bell pepper.** Achhireddy, N.R.; Fletcher, J.S.; Beevers, L. (Univ. of Oklahoma, Norman). *HortScience;* 17: No. 4, 635-637(Aug 1982). Contract AS05-80ER10628.

Accumulation of dry mass, total N, protein N, and soluble amino acid N in the developing fruit and seeds of bell pepper (Capsicum annuum L.) was determined at selected intervals following anthesis. The importance of photosynthesis to the growth and nitrogen (N) assimilation in the developing fruit wall plus placenta (FWP) and seeds was evaluated by comparing the growth and accumulation of reduced N in nonphotosynthetic and photosynthetic fruits (covered vs. uncovered). The growth rate of the FWP and seeds was similar under both conditions. After 65 days of growth, the fruits kept in the dark weighed about 15% less than those receiving illumination; seed weight was the same for both treatments. Total N content of the FWP or seed continued to increase up to 55 days after anthesis. The FWP accumulated over 90% of fruit's total N, and there were no significant differences between covered and uncovered fruits. Protein N accounted for about 50% of the total N present in both covered and uncovered fruits. 15 references, 2 figures, 2 tables.

30657 **Nitrogen regeneration by the subtropical marine copepod Eucalanus pileatus.** Gardner, W.S.; Paffenhoefer, G.A. (Great Lakes Environmental Research Lab., Ann Arbor, MI). *Journal of Plankton Research;* 4: No. 3, 725-734(1982). Contract AS09-76EV00936.

Ammonium release rates by individual marine copepods (Eucalanus pileatus) were examined kinetically over successive 10-min intervals after the animals were exposed to three concentrations of the diatom Thalassiosira fluviatilis as food. Food concentrations spanned those expected in the natural environment. Well-fed (3 mm^3 T. fluviatilis l^{-1}) copepods released ammonium significantly ($p < 0.05$) faster than those fed zero or low concentrations of food, but differences were not dramatic. Mean excretion rates (+/- SE) for animals removed from food for 18-22 h [30 +/- 6 nmol NH_4 (mg ash free dry weight)$^{-1}h^{-1}$] were ~ 60% of those for well-fed animals [49 +/- 8 nmol NH_4 (mg ash free dry weight$^{-1}h^{-1}$]. Continued high release rates after extended periods without food suggest that E. pileatus must feed frequently in nature to maintain an

adequate nitrogen balance. Depending on food concentration, animals released ammonium at rates ranging from 40 to > 100% of their N ingestion rates over the previous 18-22 h. Long-term (4-6 h) kinetic excretion experiments with well-fed animals indicated that, on average, release rates decreased with time after food removal, but patterns varied among individual copepods. In addition to ammonium release, o-phthalaldehyde reactive amino acid nitrogen was occasionally released by E. pileatus in large spurt events lasting from 20 to 60 min. 31 references, 1 figure, 2 tables.

5506 Medicine

REFER ALSO TO CITATION(S) 30310, 30430, 30439, 30651, 30652

30658 (BNL—37836) Distribution of sulfhydryl boranes in mice and rats. Slatkin, D.N.; Micca, P.L.; Laster, B.H.; Fairchild, R.G. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 9p. (CONF-860155—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009939.

From Workshop on neutron capture therapy; New York, NY, USA (22 Jan 1986).

The distribution of boron in mice bearing transplanted Harding-Passey melanomas after rapid and slow administration of monomer were studied. Thin layer chromatographic analysis of the corresponding infusion solution revealed a slow-moving principal band that was later shown to correspond to $Na_4B_{24}H_{22}S_2$, the dimer of $Na_2B_{12}H_{11}SH$. It was found that while monomer and chemically synthesized dimer yielded similar boron concentrations when they were given rapidly intraperitoneally to mice, the dimer yielded higher boron concentrations in mouse melanoma and higher melanoma-blood boron concentration when each was infused slowly intraperitoneally for 8 to 9 days. Studies have been started on the uptake of dimer into an intracerebrally implanted rat glioma. Boron levels in the rat glioma and in the mouse melanoma from slow intraperitoneal infusion of proportionately comparable amounts of dimer, are similar. However, after these slow infusions boron levels in rat blood are about as high as boron levels in rat brain tumor. 6 refs., 1 fig., 4 tabs.

30659 (CEA-CONF—8049) System architecture for high speed reconstruction in Time-Of-Flight positron tomography. Campagnolo, R.E.; Bouvier, A.; Chabanas, L.; Robert, C. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1985. 6p. (CONF-850187—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751349.

From International symposium on computer assisted radiology (CAR 85); Berlin, F.R. Germany (26 Jan 1985).

A new generation of Time-Of-Flight (TOF) positron tomograph with high resolution and high count rate capabilities is under development in our group. After a short recall of the data acquisition process and image reconstruction in a TOF PET camera, we present the data acquisition system which achieves a data transfer rate of 0.8 mega events per second or more if necessary in list mode. We describe the reconstruction process based on a five stages pipe line architecture using home made processors. The expected performance with this architecture is a time reconstruction of six seconds per image (256 x 256 pixels) of one million events. This time could be reduce to 4 seconds. We conclude with the future developments of the system.

30660 (CEA-CONF—8050) 3D reconstruction for diverging X-ray beams. Grangeat, P. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)). Jun 1985. 7p. (CONF-850638—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751351.

From CAR '85 - computer assisted radiology; Berlin, F.R. Germany (26 Jun 1985).

In order to promote 3D display techniques it is necessary to accelerate 3D acquisition devices. One solution is to use a 2D X-ray detector. In that case the acquisition procedure can be depicted by the divergent beam transform. For a circular trajectory near of the object, the slice by slice reconstruction is no more accurate. It is necessary to use a 3D reconstruction algorithm. This paper develops an original method based on an approximated evaluation of the 3D Radon Transform and on use of its inversion formula.

30661 (CONF-8606111—1) Synthesis and biological evaluation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid, a new dimethyl-branched long-chain fatty acid to evaluate regional myocardial fatty acid uptake. Goodman, M.M.; Ambrose, K.R.; Neff, K.H.; Knapp, F.F. Jr. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009461.

From 6. international symposium on radiopharmaceutical chemistry; Boston, MA, USA (29 Jun 1986).

The synthetic method for the preparation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid (DMIVN) involved introduction of substituents into the 2- and 5-positions of a thiophene ring followed by sulfur extrusion of a 2,5-dialkyl thiophene derivative to provide a key 3,3-dimethyl-branched fatty acid intermediate, 17-iodo-3,3-dimethylheptadecanoic acid. Myocardial subcellular distribution studies of the ^{125}I-labeled DMIVN in fasted rats showed a higher association of radioactivity with the microsomes when compared to the results obtained with the 19-carbon straight chain analogue. With the nonfasted rats the distribution profiles of the two analogues showed differences that seemed to correlate with the differences in myocardial retention that fasting and feeding can induce. 5 refs., 3 figs., 2 tabs.

30662 (DOE/EV/04268—T5) Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986. Laughlin, J.S. (Sloan-Kettering Inst. for Cancer Research, New York (USA). Biophysics Lab.). 1986. Contract AC02-77EV04268. 73p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009920.

The period covered by this report coincides with the advent of positron emission tomography. A commercial version of Dr. Gordon Brownell's PC-II whole-body PET was on loan from King Faisal Hospital and Research Center of Saudi Arabia to our laboratory for clinical evaluation from August 1978, until May 1981. Our use of it is reflected in 11 papers and a book chapter. Since then we have to a large extent redirected our work to projects and methods for which 3-dimensional quantitative imaging is not essential. While acquisition of a state-of-the-art, whole-body PET remains a major long-range objective for the Laboratory, it is by no means sine qua non; our HPLC studies of tumor metabolism and multiple indicator, dynamic gamma camera studies of tissue transport would remain high priorities even if we had a PET system. 96 refs., 4 figs., 4 tabs.

30663 (DOE/EV/10359—T1) Quantitative studies in radiopharmaceutical science. Progress report, January 1-December 31, 1985. Beck, R.N.; Cooper, M. (Franklin McLean Memorial Research Inst., Chicago, IL (USA)). Sep 1985. Contract AC02-80EV10359. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010376.

This program, during the past 30 years, has developed with the constant awareness of the close interrelationships and interdependence between clinical needs, radiopharmaceutical and instrument developments, and clinical feasibility studies. This is a year of transition for this contract with two of the responsible investigators, Katherine Lathrop and Paul Harper, reaching the age of mandatory retirement. This report focuses on the completion and write-up of current research projects by Dr. Harper and Mrs. Lathrop. 4 refs.

30664 (FRNC-TH—2074) Variations of dose distribution in high energy electron beams as a function of geometrical parameters of irradiation. Application to computer calculation. Villeret, O. (Toulouse-3 Univ., 31 (France)). Apr 1985. 107p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751371.

An algorithm is developed for the purpose of computer treatment planning of electron therapy. The method uses experimental absorbed dose distribution data in the irradiated medium for electron beams in the 8-20 MeV range delivered by the Sagittaire linear accelerator (study of central axis depth dose, beam profiles)

in various geometrical conditions. Experimental verification of the computer program showed agreement with 2% between dose measurement and computer calculation.

30665 **A new Compton densitometer for measuring pulmonary edema.** Loo, B.W.; Goulding, F.S.; Simon, S. (Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—).

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

Pulmonary edema (PE) is the pathological increase of extravascular lung water found most often in patients with congestive heart failure and other critically ill patients who suffer from intravenous fluid overload. The chest x-ray, the standard method for validating the presence of PE, is neither quantitative nor sensitive. A non-invasive lung density monitor that is accurate, easily portable, safe and inexpensive is needed for clinical use. To deal with the problem of attenuation along the beam paths, previous gamma-ray techniques require simultaneous measurement of transmitted and scattered beams. Since multiple scattering is a strong function of the density of the scattering medium and the mass distribution within the detection geometry, there will be inherent uncertainties in the system calibration unless it is performed on a body structure closely matched to that of each individual patient. Other researchers who have employed Compton scattering techniques generally used systems of extended size and detectors with poor energy resolution. This has resulted in significant systematic biases from multiply-scattered photons and larger errors in counting statistics at a given radiation dose to the patient. We are proposing a patented approach in which only backscattered photons are measured with a high-resolution HPGe detector in a compact system geometry. By proper design and a unique data extraction scheme, effects of the variable chest wall on lung density measurements are minimized. Preliminary test results indicate that with a radioactive source of under 30 GBq, it should be possible to make an accurate lung density, measurement in one minute, with a risk of radiation exposure to the patient a thousand times smaller than that from a typical chest x-ray.

30666 **Mesh chambers for positron emission tomography.** Lanza, R.C.; Osborne, L.S.; Holman, B.L.; Zimmerman, R.E. (Lab. for Nuclear Science, MIT, Cambridge, MA 02139). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC02-78EV04969.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

The mesh chamber consists of a multi-layer tungsten mesh gamma convertor coupled to a multiwire proportional chamber. Spatial resolution, time resolution, and efficiency are discussed for such detectors as applied to positron emission imaging systems operating in both an area and slice mode.

30667 **Mercuric iodide X-ray camera.** Patt, B.E.; Del Duca, A.; Dolin, R.; Ortale, C. (EG & G Energy Measurements, Inc., Santa Barbara Operations, Goleta, CA). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science;* NS-33: No. 1, vp(Feb 1986). (CONF-851009—). Contract AC08-83NV10282.

From IEEE nuclear science symposium; San Francisco, CA, USA (23 Oct 1985).

A prototype x-ray camera utilizing a 1.5- by 1.5-inch, 1024-element, thin mercuric iodide detector array has been tested and evaluated. The microprocessor-based camera is portable and operates at room temperature. Events can be localized within 1-2 mm at energies below 60 keV and within 3-6 mm at energies on the order of 600 keV.

30668 **Single-ring magnetic cusp low gas pressure ion source.** Bacon, F. M.; Brainard, J. P.; O'Hagan, J. B.; Walko, R. J. (to The United States of America as represented by the Department of Energy). US Patent 4,529,571. 16 Jul 1985. Filed date 27 Oct 1982. vp.

PAT-APPL-437081.

A single-ring magnetic cusp low gas pressure ion source designed for use in a sealed, nonpumped neutron generator utilizes a cathode and an anode, three electrically floating electrodes (a reflector behind the cathode, a heat shield around the anode, and an aperture plate), together with a single ring-cusp magnetic field, to establish and energy-filtering mechanism for producing atomic-hydrogen ions.

30669 **Pyruvate, Pi dikinase in bundle sheath strands as well as in mesophyll cells in maize leaves.** Aoyagi, K.; Nakamoto, H. (Lawrence Berkeley Lab., CA). *Plant Physiology;* 78: No. 3, 661-664(Jul 1985). Contract AC03-76SF00098.

Mesophyll protoplasts and bundle sheath strands were isolated from maize leaves. Light microscopic observation showed the preparations were pure and without cross contamination. Protein blot analysis of mesophyll and bundle sheath cell soluble protein showed that the concentration of pyruvate orthophosphate dikinase is about one-tenth as much in the bundle sheath cells as in mesophyll cells, but about eight times greater than that found in wheat leaves, on the basis of soluble protein. Phosphoenolpyruvate carboxylase was barely detectable in the bundle sheath cells, while ribulose-1,5-bisphosphate carboxylase and NADP-dependent malic enzyme were exclusively present in the bundle sheath cells and were absent in the mesophyll cells. Whereas pyruvate, Pi dikinase was previously considered localized only in mesophyll cells of C_4 plants, these results clearly demonstrate the presence of appreciable quantities of the enzyme in the bundle sheath cells of the C_4 species maize. 28 references, 4 figures.

30670 **Fiscal year 1986 DOE budget authorization: environmental research and development. Hearings before the Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science and Technology, US House of Representatives, Ninety-Ninth Congress, First Session, March 20, 26, 1985, No. 38.** Washington, DC; Government Printing Office (1985). 240p.

Three medical doctors involved in nuclear medicine and Alvin W. Trivelpiece and William A. Vaughan of DOE testified on DOE's research role in environmental health and safety. This role includes responsibility for nuclear medicine procedures, which total 120 million a year. Advances in nuclear medicine technology and the testimony of patients whose treatment has been successful raises questions about the administration's intent to cut the budget one per cent in this area. Among the concerns were the need to upgrade DOE laboratories and to pursue promising research avenues in such applications as the use of nuclear medicine in mental disorders. DOE witnesses also commented on the good safety record in producing and transporting energy safely because of the level of safety engineering and standards. An appendix with material submitted for the record follows the testimony of the five witnesses.

5507 Microbiology

REFER ALSO TO CITATION(S) 29487, 29681

30671 **Membrane development in the cyanobacterium, Anacystis nidulans, during recovery from iron starvation.** Pakrasi, H.B.; Goldenberg, A.; Sherman, L.A. (Univ. of Missouri, Columbia). *Plant Physiology;* 79: No. 1, 290-295(Sep 1985). Contract AC02-81ER10899.

Deprivation of iron from the growth medium results in physiological as well as structural changes in the unicellular cyanobacterium Anacystis nidulans R2. Important among these changes are alterations in the composition and function of the photosynthetic membranes. Room-temperature absorption spectra of iron-starved cyanobacterial cells show a chlorophyll absorption peak at 672 nanometers, 7 nanometers blue-shifted from its normal position at 679 nanometers. Iron-starved cells have decreased amounts of chlorophyll and phycobilins. Their fluorescence spectra (77K) have one prominent chlorophyll emission peak at 684 nanometers as compared to three peaks at 687, 696, and 717 nanometers from normal cells. Chlorophyll-protein analysis of iron-deprived cells indicated the absence of high molecular weight bands. Addition of iron to iron-starved cells induced a restoration process in which new components were initially synthesized and integrated into preexisting

membranes; at later times, new membranes were assembled and cell division commenced. Synthesis of chlorophyll and phycocyanins started almost immediately after the addition of iron. The origin of the fluorescence emission at 687 and 696 nanometers is discussed in relation to the specific chlorophyll-protein complexes formed during iron reconstitution. 26 references, 2 figures, 1 table.

5508 Morphology

30672 **Egg envelopes in vertebrates.** Dumont, J.N.; Brummett, A.R. (Oak Ridge National Lab., TN). *Developmental Biology;* **1**: 235-288(1985). Contract W-7405-ENG-26.

The authors attempt to summarize the available information about the origin, structure, composition, and function of the acellular envelopes that enclose vertebrate eggs. The information presented is a collation of data from a variety of sources in a form that facilitates comparisons of the characteristics of the egg envelopes. Although little attention has been given to the envelopes of the invertebrates, it should be clear that, if this group were included, the similarities would exceed the differences. 265 references, 15 figures.

5509 Pathology

REFER ALSO TO CITATION(S) 29501

30673 **Myeloproliferative disease in a cat.** Yates, R.W.; Weller, R.E.; Feldman, B.F. (Nob Hill Animal Clinic, Yakima, WA). *Modern Veterinary Practice;* 753-757(Oct 1984). Contract AC06-76RL01831.

Myeloproliferative disorders, a complex of cytologic abnormalities arising in the bone marrow, are among domestic animals most frequently recognized in cats but are relatively uncommon. A 4-year-old female Siamese, with splenomegaly and weight loss, was listless, anorectic, pale and dehydrated. A hemogram showed severe, macrocytic normochromic anemia, leukocytosis and reticulocytosis, with abnormally high numbers of nucleated RBC and undifferentiated blast cells. Bone marrow smears contained predominantly undifferentiated blast cells, RBC precursors and myeloblasts. The fluorescent antibody test for FeLV was positive. The cat died 66 days later despite a blood transfusion and chemotherapy. Necropsy confirmed a diagnosis of myeloproliferative disease, with hepatic and splenic invasion. 15 references, 5 figures, 1 table.

30674 **Defective DNA repair and cancer-prone disorders of man.** Cleaver, J.E. (Univ. of California, San Francisco). pp 117-135 of Genes and cancer. New York, NY; Alan R. Liss, Inc. (1984).

Hypersensitivity to various DNA-damaging agents is observed in a large number of diverse diseases involving abnormalities in the skin, central nervous and immune systems, embryologic and postnatal development. Many are associated with elevated rates of carcinogenesis. In a few diseases the hypersensitivity is large and is due to major changes in repair or replication of damaged DNA. These changes represent an important part of the genetic and biochemical pathology of recessively inherited diseases such as xeroderma pigmentosum, XP variant, ataxiatelangiectasia, Cockayne syndrome, and Fanconi's anemia. In some other diseases, including Gardner's syndrome, Chediak-Higashi syndrome, and hereditary retinoblastoma, and predominantly neurologic or muscular disorders, such as Huntington's chorea, Alzheimer's disease, Parkinson disease, and Usher syndrome, there are small increases in sensitivity that has not been related to biochemical abnormalities in DNA metabolism. There is no biochemical evidence for assuming that any of these diseases have defects in repair or replication of damaged DNA. 58 references, 3 figures, 5 tables.

5510 Physiological Systems

REFER ALSO TO CITATION(S) 30698

30675 **Relationship between stress-induced ABA and proline accumulations and ABA-induced proline accumulation in excised barley leaves.** Stewart, C.R.; Voetberg, G. (Iowa State Univ., Ames). *Plant Physiology;* **79**: No. 1, 24-27(Sep 1985). Contract AC02-82ER12028.

When excised second leaves from 2-week-old barley (Hordeum vulgare var Larker) plants were incubated in a wilted condition, abscisic acid (ABA) levels increased to 0.6 nanomole per gram fresh weight at 4 hours then declined to about 0.3 nanomole per gram fresh weight and remained at that level until rehydrated. Proline levels began to increase at about 4 hours and continued to increase as long as the ABA levels were 0.3 nanomole per gram fresh weight or greater. Upon rehydration, proline levels declined when the ABA levels fell below 0.3 nanomole per gram fresh weight. Proline accumulation was induced in turgid barley leaves by ABA addition. The threshold level of ABA for proline accumulation appeared to be similar for wilted leaves where ABA increased endogenously and for turgid leaves where ABA was added exogenously. However, the rate of proline accumulation was more dependent on ABA levels in turgid leaves to which ABA was added exogenously than in wilted leaves. Salt-induced proline accumulation was not preceded by increases in ABA-levels comparable to those observed in wilted leaves. 17 references, 4 figures.

30676 **Ethylene and the growth of rice seedlings.** Salter, S.O.; Kende, H. (Michigan State Univ., East Lansing). *Plant Physiology;* **79**: No. 1, 194-198(Sep 1985). Contract AC02-76ER01338.

Etiolated whole rice seedlings enclosed in sealed vials produced ethylene at a rate of 0.9 picomole per hour per seedling. When 2-centimeter-long shoots were subdivided into 5-millimeter-long sections, the sections containing the tip of the shoot evolved 37% of the total ethylene with the remaining 63% being produced along a gradient decreasing to the base of the shoot. The tip of coleoptile also had the highest level of the ethylene presursor 1-aminocyclopropane-1-carboxylic acid and of the ethylene-forming enzyme activity. In short-term experiments, the growth rate of decapitated seedlings was restored to almost that of intact seedlings by application of ethylene at a concentration of 10 microliters per liter. Apart from ethylene, O_2 also participates in the control of coleoptile growth. When rice seedlings were grown in a gas mixture of N_2 and O_2, the length of the coleoptiles reached a maximum at a concentration of 2.5% O_2. Lower and higher concentrations of O_2 reduced coleoptile growth. The effect of exogenous ethylene on coleoptile growth was also O_2 dependent. 25 references, 6 figures, 3 tables.

30677 **Temperature dependence of carbon isotope fractionation in CAM plants.** Deleens, E.; Treichel, I.; O'Leary, M.H. (Univ. of Wisconsin, Madison). *Plant Physiology;* **79**: No. 1, 202-206(Sep 1985). Contract AC02-83ER13076.

The carbon isotope fractionation associated with nocturnal malic acid synthesis in Kalanchoe daigremontiana and Bryophyllum tubiflorum was calculated from the isotopic composition of carbon-4 of malic acid, after appropriate corrections. In the lowest temperature treatment (17°C nights, 23°C days), the isotope fractionation for both plants is -4% per thousand (that is, malate is enriched in ^{13}C relative to the atmosphere). For K. daigremontiana, the isotope fractionation decreases with increasing temperature, becoming approximately 0% per thousand at 27°C/33°C. Detailed analysis of temperature effects on the isotope fractionation indicates that stomatal aperture decreases with increasing temperature and carboxylation capacity increases. For B. tubiflorum, the temperature dependence of the isotope fractionation is smaller and is principally attributed to the normal temperature dependences of the rates of diffusion and carboxylation steps. The small change in the isotopic composition of remaining malic acid in both species which is observed during deacidification indicates that malate release, rather than decarboxylation, is rate limiting in the deacidification process. 28 references, 1 figure, 4 tables.

30678 **Movement of abscisic acid into the apoplast in response to water stress in Xanthium strumarium L.** Cornish, K.; Zeevaart, J.A.D. (Michigan State Univ., East Lansing). *Plant Physiology;* **78**: No. 3, 623-626(Jul 1985). Contract AC02-76ER01338.

The effect of water stress on the redistribution of abscisic acid (ABA) in mature leaves of Xanthium strumarium L. was investigated using a pressure dehydration technique. In both turgid and stressed leaves, the ABA in the xylem exudate, the apoplastic ABA,

increased before bulk leaf stress-induced ABA accumulation began. In the initially turgid leaves, the ABA level remained constant in both the apoplast and the leaf as a whole until wilting symptoms appeared. Following turgor loss, sufficient quantities of ABA moved into the apoplast to stimulate stomatal closure. Thus, the initial increase of apoplastic ABA may be relevant to the rapid stomatal closure seen in stressed leaves before their bulk leaf ABA levels rise. Following recovery from water stress, elevated levels of ABA remained in the apoplast after the bulk leaf contents had returned to their prestress values. This apoplastic ABA may retard stomatal reopening during the initial recovery period. 32 references, 5 figures.

30679 **Effects of quantum flux density of photosynthesis and chloroplast ultrastructure in tissue-cultured plantlets and seedlings of Liquidambar styraciflua L. towards improved acclimatization and field survival.** Lee, N.; Wetzstein, H.Y.; Sommer, H.E. (Univ. of Georgia, Athens). *Plant Physiology;* 78: No. 3, 637-641(Jul 1985).

Liquidambar styraciflua L. seedlings and tissue-cultured plantlets were grown under high, medium, or low quantum flux densities. Net photosynthesis, chlorophyll content, and chloroplast ultrastructure of leaves differentiated from these conditions were investigated. Seedling photosynthetic rates at light saturation were positively related to light pretreatments. Cultured plantlets under all light conditions had appreciably higher photosynthetic rates than noncultured seedlings. Chlorophyll in seedlings and plantlets was significantly higher in low light-treated plants. Seedling leaves had chloroplasts with abundant starch regardless of light pretreatment. In high light, starch granules were predominant and associated with disrupted granal structure. Low light seedling chloroplasts had smaller starch grains and well-formed grana. In contrast, tissue culture-differentiated leaves were devoid of starch; grana were well organized in higher quantum flux density treatments, but disorganized at low flux densities. 29 references, 7 figures, 1 table.

30680 **Stomatal limitation to carbon gain in Paphiopedilum sp. (Orchidaceae) and its reversal by blue light.** Zeiger, E.; Grivet, C.; Assmann, S.M.; Dietzer, G.F.; Hannegan, M.W. (Stanford Univ., CA). *Plant Physiology;* 77: No. 2, 456-460(Feb 1985).

Leaves from Paphiopedilum sp. (Orchidaceae) having achlorophyllous stomata, show reduced levels of stomatal conductance when irradiated with red light, as compared with either the related, chlorophyllous genus Phragmipedium or with their response to blue light. These reduced levels of stomatal conductance, and the failure of isolated Paphiopedilum stomata to open under red irradiation indicates that the small stomatal response measured in the intact leaf under red light is indirect. The overall low levels of stomatal conductance observed in Paphiopedilum leaves under most growing conditions and their capacity to increase stomatal conductance in response to blue light suggested that growth and carbon gain in Paphiopedilum could be enhanced in a blue light-enriched environment. To test that hypothesis, plants of Paphiopedilum acmodontum were grown in controlled growth chambers under daylight fluorescent light, with or without blue light supplementation. Blue light enrichment resulted in significantly higher growth rates over a 3 to 4 week growing period, with all evidence indicating that the blue light effect was a stomatal response. Manipulations of stomatal properties aimed at long-term carbon gains could have agronomic applications.

30681 **Stomatal responses to CO_2 in Paphiopedilum and Phragmipedium: role of the guard cell chloroplast.** Assmann, S.M.; Zeiger, E. (Stanford Univ., CA). *Plant Physiology;* 77: No. 2, 461-464(Feb 1985).

A role of the guard cell chloroplasts in the CO_2 response of stomata was investigated through a comparison of the leaf gas exchange characteristics of two closely related orchids: Paphiopedilum harrisianum, which lacks guard cell chloroplasts and Phragmipedium longifolium, which has chlorophyllous guard cells. Leaves of both species had an apparent quantum yield for assimilation of about 0.05, with photosynthesis saturating at 0.300 to 0.400 millimoles per square meter per second. The response of assimilation to changes in CO_2 was similar in the two species, but the response of conductance was consistently weaker in Paphiopedilum than in Phragmipedium. The data suggest involvement of guard cell chloroplasts in the stomatal response to CO_2 and in the coupling of assimilation and conductance in the intact leaf.

30682 **Abscisic acid accumulation in spinach leaf slices in the presence of penetrating and nonpenetrating solutes.** Creelman, R.A.; Zeevaart, J.A.D. (Michigan State Univ., East Lansing). *Plant Physiology;* 77: No. 1, 25-28(Jan 1985). Contract AC02-76ER01338.

Abscisic acid (ABA) accumulated in detached, wilted leaves of spinach (Spinacia oleracea L. cv Savoy Hybrid 612) and reached a maximum level within 3 to 4 hours. The increase in ABA over that found in detached turgid leaves was approximately 10-fold. The effects of water stress could be mimicked by the use of thin slices of spinach leaves incubated in the presence of 0.6 molar mannitol, a compound which causes plasmolysis (loss of turgor). When spinach leaf slices were incubated with ethylene glycol, a compound which rapidly penetrates the cell membrane causing a decrease in the osmotic potential of the tissue and only transient loss of turgor, no ABA accumulated. Spinach leaf slices incubated in both ethylene glycol and mannitol had ABA levels similar to those found when slices were incubated with mannitol alone. Increases similar to those found with mannitol also occurred when Aquacide III, a highly purified form of polyethylene glycol, was used. When spinach leaf slices were incubated with solutes which are supposed to disturb membrane integrity no increase in ABA was observed. These data indicate that, with respect to the accumulation of ABA, mannitol caused a physical stress rather than a chemical stress.

30683 **Blue and green light-induced phototropism in Arabidopsis thaliana and Lactuca sativa L. seedlings.** Steinitz, B.; Ren, Z.; Poff, K.L. (Michigan State Univ., East Lansing). *Plant Physiology;* 77: No. 1, 248-251(Jan 1985). Contract AC02-76ER01338.

Exposure time-response curves for blue and green light-induced phototropic bending in hypocotyls of Arabidopsis thaliana (L.) Heynh. and Lactuca sativa L. seedlings are presented. These seedlings show significant phototropic sensitivity up to 540 to 550 nanometers. Since wavelengths longer than 560 nanometers do not induce phototropic bending, it is suggested that the response to 510 to 550 nanometers light is mediated by the specific blue light photoreceptor of phototropism. The authors advise care in the use of green safelights for studies of phototropism.

30684 **Peyer's patch epithelium: an imperfect barrier.** LeFevre, M.E.; Joel, D.D. (Brookhaven National Lab., Upton, NY). pp 45-56 of Intestinal toxicology. Schiller, C.M. (ed.). New York, NY; Raven Press (1984). Contract AC02-76CH00016.

Findings from this laboratory show the uptake of some but not all types of indigestible particles into murine Peyer's patches and their subsequent transport to mesenteric lymph nodes. Few particles seem to penetrate beyond the mesenteric nodes. The Peyer's patch epithelium is clearly a less effective barrier than the rest of the intestinal epithelium and, for this reason, merits special attention in toxicological studies. Such attention is perhaps most urgent in studies involving intestinal exposure to macromolecules and particulate materials, but, since much remains to be learned about the unique properties of this epithelium, it is also needed in studies utilizing small molecules, heavy metals, and lipid-soluble substances. Attention to the GALT by toxicologists may bring about new insights into the means by which diverse substances penetrate the intestinal barrier and produce injury, whether that injury be localized to the small intestine or expressed throughout the body.

5530 Agriculture And Food Technology

30685 (DOE/BP/11982—1) Study to determine the biological feasibility of a new fish tagging system. Annual report 1984. Prentice, E.F.; Sims, C.W.; Park, D.L. (USDOE Bonneville Power Administration, Portland, OR. Div. of Fish and Wildlife; National Marine Fisheries Service, Seattle, WA (USA). Coastal Zone and Estuarine Studies Div.). May 1985. Contract AI79-83BP11982. 42p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008821.

The potential of the Passive Integrated Transponder (PIT) tag for marking salmonids was evaluated. In Phase I, sham PIT tags were injected into the body cavity of juvenile salmonids. Tagged fish ranged in weight from 0.8 to 43.9 g. Observations based on six tests, ranging in time from 19 to 99 days, indicated that the test site for injecting the tag was along the mid-ventral line in the area of the pectoral or pelvic fins. Tag retention of 99% (n = 400) and survival of 99% were achieved. Minimal tissue response to the tag was noted in both tag locations. In Phase II, a PIT tag detector system designed to detect and record the passage of juvenile salmonids was evaluated. By restricting the rate at which fish entered the monitoring tunnel to one fish per second, detection averaged 94.3% compared to 86.6% for multiple fish entry. In Phase III, a monitoring system designed to detect and decode adult fish tagged with a PIT tag was evaluated. The average detection and proper decoding of these tagged fish was 94.4% for 211 fish. Improvements in the detection system are recommended.

30686 (TVA/OACD—85/9) National Fertilizer Development Center progress 84. Parker, H. (ed.). (Tennessee Valley Authority, Muscle Shoals, AL (USA)). 1985. 22p. NTIS, PC A02/MF A01. File Number DE86901274.

Goal of the National Fertilizer Development Center (NFDC) is to discover new fertilizer products and better ways to make and use them. NFDC researchers are guided by fertilizer industry leaders and other agricultural scientists to make sure that programs meet critical needs. The NFDC also is a center of technology transfer. Its scientists work closely with universities and the fertilizer industry to promote use of new developments so that the research benefits farmers and consumers quickly. This publication highlights accomplishments in these program areas for the year ended September 30, 1984.

30687 (TVA/OACD—85/11) Test-demonstration in northern New Mexico. Progress report. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Office of Agricultural and Chemical Development). Aug 1985. 17p. NTIS, PC A02/MF A01. File Number DE86901289.

Fertilizer demonstrations in New Mexico are described. (DLC)

30688 (TVA/OACD—85/13) New developments in fertilizer technology. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Office of Agricultural and Chemical Development). Oct 1985. 118p. NTIS, PC A06/MF A01. File Number DE86901276.

Objective of TVA's fertilizer technology demonstrations is to make results from research, development, and demonstration programs available to industry to facilitate their adoption. In our research and development work, we are continuing to emphasize projects that involve improving efficiency of nitrogen utilization, efficiently using US minerals and raw materials, avoiding environmental damage in fertilizer production and use, conserving energy, and using lower-cost and/or by-product raw materials and intermediates. Our program is balanced between work on dry or granular products and liquids.

30689 (TVA/OACD—6901287) Distribution maps - national fertilizer programs; agricultural programs in the seven Tennessee Valley states; Tennessee Valley region: major land uses, livestock inventories, farm products. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Technology Development). 1 Oct 1985. 50p. NTIS, PC A03/MF A01. File Number DE86901287.

Regional and National maps are used to highlight agriculture and TVA program activity in the Tennessee Valley Region and the rest of the United States. The national fertilizer programs are added this year for the first time. Readers can get a clear glimpse of where major program activities are occurring and in the Tennessee Valley region, the, concentrations of cropland, where major crops are grown, and where livestock are produced. Also included are data showing magnitude of farm product sales.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 30720, 30721

30690 (CEA-R—5326) Experimental investigation of cobalt-60 accumulation and elimination in Cyprinus carpio (L.). Fritsch, A.F. (CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France)). Nov 1985. 124p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751637.

When introduced in cation form, ^{60}Co showed a distinct tendency to form anion or neutral complexes (50% and 20%, respectively); this was favorized by a high biomass content per liter of water. The ionic evolution of the radionuclide did not affect its accumulation level in the fish. Direct contamination predominated (70%) and the concentration factor at equilibrium was 10. Nutritional transfer from Limnaea to carp, after ingestion of 45 contaminated rations in 63 days, resulted in a low radionuclide retention factor (3×10^{-3}) that was not subject to bioamplification. Cobalt-60 was primarily eliminated via urine (60%), while the fecal matter contained only 20% of the radioactive isotope ingested in the food. The ^{60}Co content of carp contaminated from the water increased proportionally with the temperature. However, the ^{60}Co concentration did not vary significantly with the thermal factor, and the radionuclide concentration factor ranged from 4 to 6 between 8°C and 25°C. Decontamination was generally a two-phase process characterized by a short biological half-life (<3 days) followed by a longer half-life (50-200 days). However, this second slow elimination phase could be broken down into two distinct stages during periods of intense metabolic activity when the observation period was sufficiently long (160 days). The muscles retained nearly 20% of the ^{60}Co contained in the fish. The high ^{60}Co content of the digestive tract may be explained by fecal excretion of the radioactive isotope (30-40% of the elimination). The kidneys act as radionuclide elimination regulators via the urinary system.

30691 (ENEA-RT-PAS—84-16) DNA repair in PHA stimulated human lymphocytes. Catena, C.; Mattoni, A. (ENEA, Rome (Italy)). 1984. 60p. (In Italian). NTIS (US Sales Only), PC A04/MF A01. File Number DE86701588.

Damage and repair of radiation induced DNA strand breaks were measured by alkaline lysis and hydroxyapatite chromatography. PHA stimulated human lymphocytes show that the rejoining process is complete within the first 50 min., afterwords secondary DNA damage and chromatid aberration. DNA repair, in synchronized culture, allows to evaluate individual repair capacity and this in turn can contribute to the discovery of individual who, although they do not demonstrate apparent clinical signs, are carriers of DNA repair deficiency. Being evident that a correlation exists between DNA repair capacity and carcinogenesis, the possibility of evaluating the existent relationship between DNA repair and survival in tumor cells comes therefore into discussion. 67 refs.

30692 (INIS-mf—9876) Axial skeleton malformations induced by 5 fluoro-2'-desoxycytidine (FCdR) and X-rays in mice of the breeding strains C57Bl/6JHanFfm, C57Bl/10JFfm, and in hamsters of the GHFfm breeding strain. A comparative evaluation considering gestation stages and dose-response-relationships. Bosse, H. (Frankfurt Univ. (Germany, F.R.). Fachbereich Humanmedizin). 4 May 1982. 162p. (In German). NTIS (US Sales Only), PC A08/MF A01. File Number DE86751632.

Genetic factors are excluded in the first part of this thesis as a possible explanation for the malformations found, shown by eval-

uation of extensive control series. The studies reported in part 2 concentrated on experiments with mice of the breeding strains C57B1/6 and C57BL/10, from days 4-14, in order to check what effects are to be expected after application of FCdR, registrating all single malformations, and whether there are significant differences to be found among the two strains. The evaluation of experiments indicates no significant differences with regard to axial skeleton malformations in the two strains related to each other. Sensitive phases with clearly marked maxima could be found for each type of malformation. Differences among the various mice breeding strains were clearly observed with regard to the period of sensitive phases, and the localisation of sensitivity maxima. Part 3 reports on dose-response relationships after application of FCdR to mice of the breeding strains as above, but at different stages of gravidity (days 8, 9, 11). The results of these experimental series confirm or complete the information on the mechanisms involved. The results of the experiments discussed in part 4 show that enhanced doses of the same teratogenic agent, applied to golden hamsters, do not provoke significantly different effects than those observed in the mice. The differences detected indicate a much faster development of individual organ anlagen, with only slight differences in details, as compared to the mice. Part 5 deals in detail with the effects of X-irradiation applied in enhanced doses (7-130 r), on day 8. These experiments, too, confirmed in principle the mechanisms observed in the above experiments.

30893 **(INIS-mf—9877) Radiobiological studies on eggs of the rice weevil (Tribolium confusum) after exposure to heavy primary particles of the cosmic radiation.** Geyer, B. (Marburg Univ. (Germany, F.R.). Fachbereich Humanmedizin). 18 Jun 1982. 44p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751633.

The thesis explains the radiation effects observed during the holometabolism of Tribolium confusum after exposure of the eggs to heavy primary particles of cosmic radiation, i.e. to atomic nuclei of relatively high energy with a mass greater than helium atoms. The first section describes the technical layout of the BIOSTACK experiment and the fixation of the Tribolium eggs and the positioning of the nuclear track detectors. This part is followed by the description of methods used to detect the eggs hit by the heavy nuclei, and their isolation and subsequent growth. Terrestrial irradiation of eggs with x-rays served as a control, as well as unirradiated egg cultures. The amount of larvae produced from incubated eggs hit by heavy nuclei was 66%, that of eggs exposed to cosmic background radiation was 69%, and that produced by the control culture kept on the earth was 87%. Investigations of egg samples during various stages of embryogenesis showed differences in the histological findings of the various groups, especially between the two groups of the BIOSTACK experiment. The lethality of larvae in the period from emergence up to pupal stage was relatively high (50%) in the group hit by heavy nuclei, especially when compared to the other BIOSTACK experimental group, where this percentage was 10%, and to the terrestrial control group (3%). Also, vitality of larvae of the first group was considerably reduced. In the pupal stage, the lethality observed in all three test groups was relatively low with 2-4%. From the animals produced from eggs hit by heavy nuclei, only 25% were still alive after 4 months, from the other space flight group these were 75%, and from the terrestrial control group 93%. Also, the animals from the first group showed a significant increase in bodily anomalies.

30894 **(KFK—3826-B) Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984.** Schieferdecker, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Medizinische Abt.). Oct 1985. 43p. (In German). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751408.

At the Toxicological Laboratory of the Medical Department of the Karlsruhe Nuclear Research Center about 5000 analyses in biological material (urine, feces, blood, tissue, nose swab) were performed annually between 1979 and 1984, mainly with a view to detecting plutonium, americium, uranium and tritium in the framework of incorporation monitoring by excretion analyses. In the majority of cases no incorporation were found in regular monitoring. Tritium incorporations occured solely with persons working at the heavy water moderated reactors. At the Kernkraftwerk-Betriebsgesellschaft the annual collective doses attained values between 60 and 74 mSv and decreased during the last year while work was brought to an end. The maximum individual body doses are less than 5 mSv/a and for the group of exposed persons they are one an average inferior to 0.5 mSv/a. In the course of measurements required by special occasions about 50 to 90 persons per year were monitored in addition during the initial years and up to 250 persons per year during the last years out of concern about a possible incorporation. During the six years of reporting 4504 analyses involving 761 persons produced three incorporations beyond the double limit value of the annual activity intake as laid down in the Radiation Protection Ordinance. With three persons values between 50% and 100% of the limit value were found, with 31 persons values between 5% and 50%. The examinations of 343 persons did not reveal incorporations going beyond 5% of the limit values, and 381 persons were monitored without an estimate being made. These were obviously trivial cases or persons working outside the Karlsruhe Nuclear Research Center for which the estimates were made by the competent Radiation Protection Commissioner. (orig./MG).

30895 (NUREG/CR—4214, pp II.181-II.234) **Thyroid effects.** Maxon, H.; Thomas, S.; Buncher, C.; Book, S.; Hertzberg, V. (Univ. of Cincinnati, OH). Jul 1985. NTIS, PC A16/MF A01 - GPO. File Number TI85017968. (SAND—85-7185).

In Health effects model for nuclear power plant accident consequence analysis. Part 1. Introduction, integration, and summary. Part II. Scientific basis for health effects models.

Risk coefficients for thyroid disorders have been developed for both ^{131}I and external x or gamma low-LET radiation. A linear, no-threshold model has been used for thyroid neoplasms. A linear, threshold model has been used for other thyroid disorders. Improvements since the Reactor Safety Study were made possible by relevant new animal and human data. Major changes are as follows. Animal data are used to supplement the human experience where necessary. A specific risk estimate model is used for thyroid neoplasms, which accounts for observed effects of gender and age at exposure on risk. For thyroid cancer, the basis of the risk coefficients is the experience of North Americans following x-irradiation for benign disease in childhood. This recognizes possible differences in susceptibility in people of different heritage. A minimum induction period for thyroid neoplasms following irradiation is used to define periods at risk. An upper bound risk coefficient for cancer induction following exposure to ^{131}I is based on human experience at relatively low dose exposures. While the overall lifetime risks of death due to thyroid cancer are consistent with projections by the ICRP, BEIR III, and UNSCEAR Reports, the current model permits greater flexibility in determining risk for population subgroups. 88 references, 8 tables.

30896 **(PNL—5750-Pt.1) Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences.** Park, J.F. (Pacific Northwest Labs., Richland, WA (USA)). Feb 1986. Contract AC06-76RL01830. 125p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86009671.

This report summarizes progress on OHER biomedical and health-effects research conducted at PNL in FY 1985 to develop information for a comprehensive understanding of the interaction of energy-related radiation and chemicals with man. Our continuing emphasis on decreasing the uncertainty of health-effects risk estimates to man from existing and/or developing energy-related technologies supports the DOE goal of increasing and diversifying national energy resources and decreasing risks to human health. The report is arranged to reflect the PNL research relative to OHER programmatic needs. The first section concerns evaluation of possible health effects among nuclear workers. The next two sections, which contain reports of health-effects research in biological systems, include health effects of radiation and health effects of chemical mixtures. The last section is related to medical applications of nuclear technology.

30697 (UCRL—94428) Local and global deposition of radioactivity: a reassessment. Shapiro, C.S.; Harvey, T.F.; Peterson, K.R. (Lawrence Livermore National Lab., CA (USA); San Francisco State Univ., CA (USA)). Apr 1986. Contract W-7405-ENG-48. 31p. (CONF-8508154—5). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009392.

From International seminar on nuclear war; Erice, Italy (19 Aug 1985).

Potential radiation doses from several scenarios involving nuclear attack on an unsheltered United States population are calculated for local and global fallout. Dose estimates are made for both a normal atmosphere and an atmosphere perturbed by smoke produced by massive fires. Finally, in an appendix the direct effects of fallout on humans are considered. These include effects of sheltering and biological repair of damage from chronic doses.

30698 Photosynthate supply and utilization in alfalfa: a developmental shift from a source to a sink limitation of photosynthesis. Baysdorfer, C.; Bassham, J.A. (Lawrence Berkeley Lab., CA). *Plant Physiology;* 77: No. 2, 313-317(Feb 1985). Contract AC03-76SF00098.

Long-term carbon dioxide enrichment, $^{14}CO_2$ feeding, and partial defoliation were employed as probes to investigate source/sink limitations of photosynthesis during the development of symbiotically grown alfalfa. In the mature crop, long-term CO_2 enrichment does not affect the rates of net photosynthesis, relative growth, ^{14}C export to nonphotosynthetic organs, or the rates of ^{14}C label incorporation into leaf sucrose, starch, or malate. The rate of glycolate labeling is, however, substantially reduced under these conditions. When the mature crop was partially defoliated, a considerable increase in net photosynthesis occurred in the remaining leaves. In the seedling crop, long-term CO_2 enrichment increased dry matter accumulation, primarily as a result of increases in leaf starch content. Although the higher rates of starch synthesis are not maintained, the growth enhancement of the enriched plants persisted throughout the experimental period. These results imply a source limitation of seedling photosynthesis and a sink limitation of photosynthesis in more mature plants. Consequently, both the supply and the utilization of photosynthate may limit seasonal photosynthesis in alfalfa.

30699 Role of potassium-40 in evolutionary mutagenesis. Gevertz, D.; Friedman, A.M.; Katz, J.J.; Kubitschek, H.E. (Argonne National Lab., IL). *American Society for Microbiology Abstracts of the Annual Meeting;* 119(1985).

The radioactive isotope ^{40}k is the largest source of natural radioactivity within living cells. Although ^{40}K occurs naturally in low abundance (0.01% of all potassium), it represents approximately 40% of the internal radiation dose in man. It has been suggested that decay of ^{40}K by electron capture has played a significant role in gene mutation and evolution. The authors examined cell growth and mutagenicity in several strains of E. coli grown in Tris medium containing natural potassium or potassium greatly depleted in ^{40}K. Doubling times were the same in both media. In glucose limited chemostat cultures containing natural potassium or depleted potassium, there was no significant difference in mutation rate to bacteriophage T5 resistance, within standard errors of about 15%. In all cases, the mutation rate to T5 resistance was approximately 3 x 10^{-8} mutants $cell^{-1}$ $generation^{-1}$. The authors conclude that for mutation to T5 resistance, there was no measurable contribution of naturally occurring ^{40}K to the spontaneous mutation rate.

30700 Inhibition by hyperthermia of repair synthesis and chromatin reassembly of ultraviolet-induced damage to DNA. Bodell, W.J.; Cleaver, J.E.; Roti Roti, J.L. (Univ. of California, San Francisco). *Radiation Research;* 100: 87-95(1984). Contract AC03-76SF01012.

The authors have investigated the effects of hyperthermia treatment on sequential steps of the repair of UV-induced DNA damage in HeLa cells. DNA repair synthesis was inhibited by 40% after 15 min of hyperthermia treatment at 45°C; greater inhibition of repair synthesis occurred with prolonged incubation at 45°C. Enzymatic digestion of repair-labeled DNA with Exonuclease III indicated that once DNA repair was initiated, the DNA repair patch was synthesized to completion and that ligation of the DNA repair patch occurred. Thus, the observed inhibition of UV-induced DNA repair synthesis by hyperthermia treatment may be the result of inhibition of enzymes involved in the initiating steps(s) of DNA repair. DNA repair patches synthesized in UV-irradiated cells labeled at 37°C with[^{3}H]Thd were 2.2-fold more sensitive to micrococcal nuclease digestion than was parental DNA; if the length of the labeling period was prolonged, the nuclease sensitivity of the repair patch synthesized approached that of the parental DNA. DNA repair patches synthesized at 45°C, however, remained sensitive to micrococcal nuclease digestion even after long labeling periods, indicating that heat treatment inhibits the reassembly of the DNA repair patch into nucleosomal structures. 23 references, 3 figures, 2 tables.

30701 Behavior of ^{137}Cs-tagged particles in a fescue meadow. Dahlman, R.C.; Auerbach, S.I.; Dunaway, P.B. (Oak Ridge National Lab., TN). pp 153-165 of Environmental contamination by radioactive materials. Vienna, Austria; International Atomic Energy Agency (1969).

Enclosures of tall fescue (Festuca arundinacea), 0.01 ha in area, were contaminated at the rate of 25 g/ft^2 using artificial fallout (^{137}Cs fused to 88-177 μm silica sand, ~ 100 μCi/g, 15% leachable in water) to study the effects of close-in fallout on a grass system. Investigations of radiation effects, intercompartmental cycling of radiocesium and secondary movements of the simulant particles in soil and litter have been in progress since mid-summer, 1968. Plant community response (yield, seed production and species composition), small mammal physiology (haemopoietic and gut effects) and insect population dynamics are being studied following exposure to chronic, internal-external, beta-gamma radiation. Sand particles intercepted by grass blades were readily dislodged by light wind, and maximum retention time was approximately 10 days. The simulant was readily trapped in the leaf axils where it remained for 4 weeks until washed off by rain. There was significant transfer (15%) of ^{137}Cs from simulant to vegetation. Vacuum and brush cleaned vegetation initially contained 1.32 μCi/g (living parts) and 4.62 μCi/g (dead parts). 13 references, 5 figures, 4 tables.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 30620

30702 Temperature selection by juvenile striped bass in laboratory and field. Coutant, C.C.; Zachman, K.L.; Cox, D.K.; Pearman, B.L. (Oak Ridge National Lab., TN). *Transactions of the American Fisheries Society;* 113: 666-671(1984). Contract AC05-84OR21400.

Juvenile striped bass Morone saxatilis, 80-300 mm in total length and acclimated to 22-24 C, generally selected temperatures in the range 24-27 C during spring and summer in laboratory horizontal temperature gradients and electronic shuttleboxes and in exploratory telemetry trials at a freshwater quarry lake. During autumn, preferred temperatures in laboratory gradients declined to 20-25 C. 35 references, 2 tables.

30703 Effects of pesticide on biota and breakdown of forest litter. Crossley, D.A. Jr.; Witkamp, M. (Oak Ridge National Lab., TN). pp 887-892 of 8th international congress of soil science. Bucharest, Romania; Publishing House (1965).

From 8. international congress of soil science; Bucharest, Romania (1964).

Naphthalene was used to separate the effects of soil fauna and microflora on the breakdown of oak leaves. Microanthropods fragment the leaf material and mix it with soil, but bacteria and fungi are responsible for the actual decay. To separate these different effects an insecticide was used to reduce arthropod populations in the litter. The resulting changes in litter fauna and microflora produced changes in rates of weight loss and radiocesium loss from the decaying litter. After a preliminary experiment naphtalene was selected as a suitable insecticide because it was highly effective against arthropods and affected the microflora less than did paradichlorobenze, dieldrin, or chordane. A description of the working method is given. The results show that the litter fauna has a pronounced influence on the rate of breakdown and the release of nu-

trient minerals from forest litter. Killing of the arthropods presumably stimulated the early microflora on the surface of the leaves, whereas a gradual increase of microflora, occurred on normally decomposing litter. 5 references, 2 figures.

5603 Chemicals Metabolism And Toxicology

REFER ALSO TO CITATION(S) 29227, 30696, 30703

30704 (CONF-8411253—Vol.1) **State of forest decline in the Federal Republic of Germany. Vol. 1.** (Verein Deutscher Ingenieure (VDI) - Kommission Reinhaltung der Luft, Duesseldorf (Germany, F.R.)). 1985. 183p. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

In order to discuss on a scientific basis the true extent of the decline of forests, the causes of which scientists have not yet been able to clearly pin down, the Clean-Air Commission of the Association of German Engineers (VDI) convened a workshop. The volume contains the papers presented at that event, all of which were recorded individually. They specifically report the results of the 1984 survey on forest decline and discuss the current state of forest decline in Bavaria, Baden-Wuerttemberg, Hesse, North-Rhine-Westphalia, Lower Saxony, Switzerland and Central Europe. Thought is also given to the further development of large-scale inventories of forest decline and a comparison made of the methods of survey adopted in the Federal Republic of Germany and Austria. (orig./HSCH).

30705 (CONF-8411253—Vol.1, pp 5-20) **Conspectus of the results of the 1984 inventory on forest decline.** Breloh, P. (Bundesministerium fuer Ernaehrung, Landwirtschaft und Forsten, Bonn, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

The 1984 inventory on forest decline showed a total damage area of 3.7 million hectars corresponding to 50% of all German forest. According to the 1983 survey 2.5 million hectares, i.e. 34% of the forest area, were damaged. Even if allowance is made for the methodical improvements as against the previous year the fact remains that substantially more and severer damage is recorded as compared to 1983. The damage shows a marked incline from south to north. The two south German Laender Bavaria and Baden-Wuerttemberg have a share of above 60% in the total area of damage, being the most strongly affected ones with 57 respectively 66% of declining forest area. Concentrations of damage are seen not only in middle and high-range mountains, but also in landscapes at low altitudes. (orig./HSCH).

30706 (CONF-8411253—Vol.1, pp 21-35) **Current damage situation in Bavaria.** Kennel, E. (Bayerische Forstliche Versuchs- und Forschungsanstalt, Muenchen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

In Bavaria 26% of the total area exhibit obvious symptoms of damage (medium to severe deterioration). This is twice as much as the year before. Leaf-wood, too, shows more marked signs of damage, the share has risen to 15% of the area. The highest shares in percent of deteriorated forest were found in north-eastern and eastern Bavaria and in the area of the Alps and Alpine foreland. (orig.).

30707 (CONF-8411253—Vol.1, pp 37-55) **Current damage situation in Baden-Wuerttemberg.** Schoepfer, W. (Forstliche Versuchs- und Forschungsanstalt Baden-Wuerttemberg, Freiburg im Breisgau, Germany, F.R. Abt. Biometrie und Informatik). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

Coniferous trees and leaf-wood showed a rather different course of the disease. The dramatic deterioration in coniferous trees between 1982 and 1983 has notably ebbed away. This is shown in an average increase in the loss of needles in spruces by 'only' 4.0% respectively 3.5% and in firs by 5.0% respectively 3.1% for trees up to 60 years old or above in the whole of the land. However it is alarming to see that the portion of spruces more than 60 years old exhibiting medium severe damage has gone up from 32 to 44% and that the portion of healthy trees has been halved (from 13 to 7%). A lamentable deterioration has occurred in the condition of leaf-wood as against the previous year. This rapid decline is reflected in an increase in the average rate of defoliation in beech-trees of 5.9 respectively 7.8% and in oak-trees of 8.5 respectively 8.0% for trees up to 60 years old and above. (orig./HSCH).

30708 (CONF-8411253—Vol.1, pp 57-73) **Current damage situation in Hesse.** Gaertner, E. (Hessische Forstliche Versuchsanstalt, Hann Muenden, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

The recordings of damage carried through in Hesse as a part of the federal inventory on declining forest of 1984 show that the current deterioration of forest is apt to occur with very different intensities in the individual tree species and can exhibit various area distribution patterns according to tree species. From the intensive 15-tree sampling carried through as an indicator for spruces of medium age it is clear that the geographic position of the forest areas is a predominant factor of the intensity and extension of the new kind of forest decline. (orig.).

30709 (CONF-8411253—Vol.1, pp 75-91) **Current damage situation in North-Rhine-Westphalia.** Genssler, H. (Landesanstalt fuer Oekologie, Landschaftsentwicklung und Forstplanung Nordrhein-Westfalen, Recklinghausen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

In the 854,000 hectares of wooded land in North-Rhine-Westphalia, forest deterioration has gone up from 35% in 1983 to 42% in 1984. This means that in spite of ample precipitations and rare sunshine, a weather condition favouring the growth of forest, the latter is continuing to waste away. Spruce, which occurs predominantly in the secondary chains of mountains at great distance from the sources of emission, is the species most seriously affected. 40% of the area covered by it are deteriorated. The development of damage in leaf-wood is particularly alarming. In consequence of an above-average increase in damage by 10%, 37% of all leaf-trees are now found to be affected as well. This means that, contrary to the assumption of leaf-wood being more resistant to immissions, it does not constitute a true alternative to forest damaged by pollution. (orig./HSCH).

30710 (CONF-8411253—Vol.1, pp 93-106) **Forest damage in Lower Saxony.** Gussone, H.A. (Niedersaechsische Forstliche Versuchsanstalt, Goettingen, Germany, F.R.). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

The first inventory to be made of forest decline in Lower Saxony was done in 1984 by sampling. The paper describes the distribution and characteristics of the 752 sampling spots. The results of the 1984 survey are not strictly comparable with previous ones on account of a change in the method. Nonetheless an increase in the damage is clearly evident; it results from a more serious affection of leaf-trees and moreover from the fact that leaf and needle decolourations were covered by the damage inventory as well. The latter also accounts for the discrepancy between terrestrial survey and aerial photography inventory for Lower Saxony in 1983. (orig./HSCH).

30711 (CONF-8411253—Vol.1, pp 119-125) **Current state of forest decline in Central Europe.** Donaubauer, E. (Forstliche Bundesversuchsanstalt, Vienna, Austria). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

In the forests of Central Europe macroscopic symptoms of damage occur very inhomogeneously and in greatly varying intensity; from the geographic distribution it is not at present possible to derive a relationship between immission load and the incidence of symptoms. Investigations into the causes therefore seem particularly important. Strikingly, there is a massive incidence in several tree species of numerous diseases and insect pests, which makes it particularly difficult or even impossible at present to relate symptoms to a specific cause by macroscopic analysis only. (orig.).

30712 (CONF-8411253—Vol.1, pp 127-175) **Reflections regarding the further development of forest decline inventories for large areas.** Schoepfer, W. (Forstliche Versuchs- und Forschungsanstalt Baden-Wuerttemberg, Freiburg im Breisgau, Germany, F.R. Abt. Biometrie und Informatik). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

The terrestrial forest decline inventory of 1984 was first to supply fully comparable statistical data on the extension and regional distribution of damage in forest for the whole area of the Federal Republic of Germany. In only two years it was possible to devise a method for terrestrial inventory on a sampling basis that meets federal demands entirely and leaves at the same time sufficient scope for special wishes of the individual Laender. This assures a decisive process technological standard. The hectic of the first years is now no longer necessary in further developing, working out in detail and bringing to completion individual components of this concept of inventory. The explanations are intended to provide ideas and stimuli for a continuous further development. The author deals among other things with the accuracy of the inventory, sampling errors, recording and/or estimation errors, systematic error sources, mapping, improvement of autotype mapping, isoline map as an alternative. (orig./HSCH).

30713 (CONF-8411253—Vol.1, pp 177-187) **Comparison of the methods of survey adopted in the Federal Republic of Germany and Austria.** Donaubauer, E. (Forstliche Bundesversuchsanstalt, Vienna, Austria). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

Investigations in connection with the symptoms of forest decline in the Federal Republic of Germany and Austria start from the assumption that immissions from air pollutants are a possible cause. Surveys are now made and investigations carried through uniformly and comprehensively in either state every year; in some Laender of the Federal Republic of Germany the emphasis is on the inventory of symptoms, in Bavaria it has been current practice for years to conduct a chemical needle analysis previously, and this has also been a part of the investigation programme in Baden-Wuerttemberg since 1983. In Austria a network for chemical needle analysis and recording of the condition of the forest has been created covering the entire federal territory. In respect of the causes of the damage a combination of several methods is generally considered to be important. (orig.).

30714 (CONF-8411253—Vol.1, pp 107-118) **Swiss forest damage inventory of 1984.** Schmid-Haas, P.; Haemmerli, F.; Walther, G. (Eidgenoessische Anstalt fuer das Forstliche Versuchswesen, Birmensdorf, Switzerland). 1985. (In German). NTIS (US Sales Only), PC A09/MF A01. File Number DE86751717.

From Workshop on the state of forest decline in the Federal Republic of Germany; Duesseldorf, F.R. Germany (26 Nov 1984).

Schriftenreihe der VDI-Kommission Reinhaltung der Luft. Vol. 1.

Between July and September 1984 some 27,000 trees in 2,500 sampling lots in national-owned forest and forest accessible by roads in Switzerland were carefully studied. The report deals with the method of survey and most important results. Spruce are damaged in a portion of 35%, fix and larch rather in the same range with 39% and 36%, respectively. Scotch pine is by far the most frequently damaged species. Already, more than half of all Scotch pines are in a state of deterioration. Leaf-trees are damaged, too, although in varying degree. Most widely affected are oak-trees with 30%. An exact comparison between the results of 1983 and 84 is possible for that third part of Switzerland which was covered by the Swiss national forestry inventory of 1983. In this part of the country the portion of affected coniferous trees (excluding larch) has risen between 1983 and 84 from 13 to 41%. Within a year the portion of affected conifers in Switzerland has about trebled. (orig./HSCH).

30715 (DOE/ER/60158—2) **Environmental carcinogens in human target tissues in culture. Progress report.** Hsu, I.C. (Maryland Univ., Baltimore (USA). Dept. of Pathology). 19 Feb 1986. Contract AS05-83ER60158. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009802.

Cells from different organ or animal species have shown diverse activities in activation and detoxification of chemical carcinogens. Based on the mutation assays, human hepatocytes were more effective than animal hepatocytes in detoxification of aromatic nitrogen compounds. The adduct formation was also different in human and rodent hepatocytes exposed to aminofluorene (AF) or acetylaminofluorene (AAF). Both AF and AAF adduct DNA were observed in rat liver cells exposed to AF or AAF. However, very little acetylation or deacetyl of the DNA adducts occurred in the human hepatocytes. Human hepatocytes treated with AF in primary culture produced mainly AF adducted DNA while AAF treated cells formed AAF adduct DNA. 2 figs., 1 tab.

30716 (EPRI-EA—4447-Vol.1) **Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 1. Extrapolation from animals to man.** (Meeting Planning Associates, Menlo Park, CA (USA)). Mar 1986. 97p. (CONF-8212109—). Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920253.

From Conference on new directions: the extrapolation of health risks from animals to man; Carmel, CA, USA (1 Dec 1982).

The workshop explored various research opportunities related to the stated need. Presentations were made on historical perspectives and future research needs for improving extrapolations, the use of in vitro mutagenesis tests to evaluate potency of a compound, limitations of epidemiology studies in a regulatory environment, quantitative use of animal data in evaluating carcinogenic potency, methodologies for estimating human carcinogenesis using various dose rate equivalents, and common pharmacokinetic problems affecting interspecies comparisons. The major recommendation focused on more meaningful risk assessments through the use of pharmacokinetics to aid in the extrapolation of animal data to man. Papers on the above subjects have been abstracted separately.

30717 **(EPRI-EA—4447-Vol.2) Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 2. Toxicokinetics.** (Meeting Planning Associates, Menlo Park, CA (USA)). Mar 1986. 134p. (CONF-8312135—). Research Reports Center, Box 50490, Palo Alto, CA 94303. File Number TI86920254.

From Conference on new directions: the extrapolation of health risks from animals to man; San Diego, CA, USA (1 Dec 1983).

The workshop explored the role of toxicokinetics in the safety evaluation of chemicals when making risk assessments. This volume presents the theoretical discussions and suggested research plans. Discussions centered on species differences in absorption, plasma-protein binding, dose response curves, physiologically-based pharmacokinetic models, metabolite concentrations in toxicokinetic modeling, use of model systems in pharmacokinetics, dose-dependent kinetics and limitations of risk assessment models. Several approaches suggested for toxico-pharmacokinetic studies included DNA adduct investigations of compounds previously tested for carcinogenicity, liver-tumor hepatocyte correlations, liver-tumor/liver toxicity correlations, and pharmacokinetic evaluations and bioassays of new chemicals. Separate abstracts have been prepared for the papers.

30718 **(GSF—35/85) Cadmium retention in the kidneys of chicks as influenced by phytate in the feed.** Meiringer, G.; Rambeck, W.A.; Kollmer, W.E.; Zucker, H. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.); Muenchen Univ. (Germany, F.R.). Fachbereich Tiermedizin). Nov 1985. 122p. (In German). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751725.

In three experiments cadmium retention in the kidney and its dependence upon various cadmium compounds, phytate concentrations and calcium amounts was studied in two different feed types. Except for a slight tendency whereupon the bioavailability of Cd-chloride in corn-soy rations was somewhat lower than of Cd_3- and Cd_9-phytate no marked difference could be noted between the three cadmium compounds. An influence by increasing phylate levels in the feed could not definitely be proven. An excess of calcium lead to comparatively lower cadmium values in the kidneys in all experimental groups. This effect was particularly clearly seen in corn-soy rations with high amounts of phytate. (orig./MG).

30719 **(KFK—3996) Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead.** Liese, T.; Schmidt, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Dec 1985. 71p. (In German). NTIS (US Sales Only), PC A04/MF A01. File Number DE86751726.

A pot experiment was made with lolium multiflorum to measure the transfer soil to plant for heavy metals without deposition on the plant surface. The soil contamination varied for Co from 5-400 $\mu g/g$ soil, for Pb from 10-1800 $\mu g/g$ soil and for Cr from 10-1000 $\mu g/g$ soil. High concentrations of one of these elements influence the physiological processes in the plant. This causes a lower water consumption and lower crop yield. The transfer factor of Co is in a range from 0.1 to 1.3. The factor increases with increasing soil concentration, but decreases then, if Co concentration in soil becomes very high. The transfer factor of Cr is in a range of 10^{-4} to 10^{-2}. Increasing Cr concentration in soil decreases the transfer factor. The transfer factor of Pb varies in a range of 10^{-2} to 3.10^{-2} without a clear dependence on time or Pb concentration in soil. (orig.).

30720 **(ORNL—6248) Biology Division progress report, October 1, 1984-September 30, 1985.** (Oak Ridge National Lab., TN (USA)). Jan 1986. Contract AC05-84OR21400. 201p. NTIS, PC A10/MF A01; GPO Dep. File Number DE86005346.

The body of this report provides summaries of the aims, scope and progress of the research by groups of investigators in the Division during the period of October 1, 1984, through September 30, 1985. At the end of each summary is a list of publications covering the same period. For convenience, the summaries are assembled under Sections in accordance with the current organizational structure of the Biology Division; each Section begins with an overview. It will be apparent, however, tha crosscurrents run throughout the Division and that the various programs support and interact with each other. In addition, this report includes information on the Division's educational activities, Advisory Committee, seminar program, and international interactions, as well as extramural activities of staff members, abstracts for technical meetings, and funding and personnel levels.

30721 **Use of cytogenetic endpoints in human lymphocytes as indicators of exposure to genotoxicants.** Preston, R.J. (Oak Ridge National Lab., TN). pp 41-50 of New approaches in toxicity testing and their application in human risk assessment. Li, A.P. (ed.). New York, NY; Raven Press (1985). Contract W-7405-ENG-26.

Since the observation by Moorhead et al (1960) that peripheral lymphocytes could be stimulated by phytohemagglutinin (pha) to enter the cell cycle and observed at metaphase, there has been an enormous amount of data obtained on the induction of chromosome alterations by radiation and chemical agents with this lymphocyte assay system. It has generally been regarded as a simple and informative assay for human population monitoring, as an aid to providing information on potential clastogenic (or mutagenic) exposures. As will be suggested, this view should be regarded with great caution with regard to chemical exposures, particularly in contrast to radiation exposures. It is premature to assume that information on the level of exposure or subsequent adverse health effects can be ascertained or determined from measures of chromosome alteration frequencies or sister chromatid exchange frequency in mitogenically stimulated human peripheral lymphocytes. This chapter will address the issue of the utility of the lymphocyte assay, with reference to the underlying mechanisms of induction of chromosome alterations, and also will discuss possible ways of increasing the sensitivity of the assay in order to make it more useful for population monitoring. 29 references.

30722 **Saturation of repair.** Setlow, R.B. (Brookhaven National Lab., Upton, NY). pp 251-260 of Assessment of risk from low-level exposure to radiation and chemicals. Woodhead, A.D.; Shellabarger, C.J.; Pond, V.; Hollaender, A. (eds.). New York, NY; Plenum Publishing Corp. (1985).

The deleterious effects of the exposure of cells, tissues or animals to exogenous radiations and chemicals are ameliorated by DNA repair processes. Many repair pathways are constitutive, and some, such as the SOS system in bacteria, are inducible while others, such as the UvrABC excision system in E. coli, are both constitutive and inducible. The ability of bacteria to adapt to low chronic doses of N-methyl-N-nitro-N-nitrosoguanine (MNNG) so as to become resistant to the cytotoxic or mutagenic effects of a large challenge dose is an important example illustrating that low chronic exposures not only may protect against subsequent high acute ones but also that extrapolation from high acute doses to low chronic ones may grosaly overestimate the biological effects of the low chronic doses. 33 references, 3 tables.

30723 **Prospects for cellular mutational assays in human populations.** Mendelsohn, M.L. (Lawrence Livermore National Lab., CA). pp 415-427 of Assessment of risk from low-level exposure to radiation and chemicals. Woodhead, A.D.; Shellabarger, C.J.; Pond, V.; Hollaender, A. (eds.). New York, NY; Plenum Publishing Corp. (1985). Contract W-7405-ENG-48.

Practical, sensitive, effective, human cellular assays for detecting somatic and germinal mutations would have great value in environmental mutagenesis and carcinogenesis. When available, such assays should allow us to fill the void between human mutagenicity and the data that exist from short-term tests and from mutagenicity in other species. We will be able to validate the role of somatic mutations in carcinogenesis, to identify environmental factors that affect human germ cells, to integrate the effects of complex mixtures and the environment in the human subject, and to identify people who are hypersusceptible to genetic injury. Human cellular mutational assays, particularly when combined with cytogenetic and heritable mutational tests, promise to play pivotal roles in estimating the risk from low-dose radiation and chemical expo-

sures. These combined methods avoid extrapolations of dose and from species to species, and may be sensitive enough and credible enough to permit politically, socially and scientifically acceptable risk management. 16 references.

30724 **Assignment of genes encoding metallothioneins I and II to Chinese hamster chromosomes 3. Evidence for the role of chromosome rearrangement in gene amplification.** Stallings, R.L.; Munk, A.C.; Longmire, J.L.; Hildebrand, C.E.; Crawford, B.D. (Los Alamos National Lab., NM). *Molecular and Cellular Biology;* 4: No. 12, 2932-2936(Dec 1984).

Cadmium resistant (Cd/sup r/) variants with coordinately amplified metallothionein I and II (MTI and MTII) genes have been derived from both Chinese hamster ovary and near-euploid Chinese hamster cell lines. Cytogenetic analyses of Cd/sup r/ variants consistently revealed breakage and rearrangement involving chromosome 3p. In situ hybridization with Chinese hamster MT-encoding cDNA probe localized amplified MT gene sequences near the translocation breakpoint involving chromosome 3p. These observations suggested that both functionally related, isometallothionein loci are linked on Chinese hamster chromosome 3. Southern blot analyses of DNAs isolated from a panel of Chinese hamster x mouse somatic cell hybrids which segregate hamster chromosomes confirmed that both MTI and MTII are located on chromosome 3. The authors speculate that rearrangement of chromosome 3p could be causally involved with the amplification of MT genes in Cd/sup r/ hamster cell lines. 34 references, 3 figures, 1 table.

30725 **Chromatographic chemical characterization of solvent refined coal I and II.** Wright, C.W.; Weimer, W.C.; Springer, D.L. (Battelle, Pacific Northwest Lab., WA). *Chromatographia;* 18: No. 11, 603-610(Nov 1984). Contract AC06-76RL01830.

High resolution gas chromatography and gas chromatography/mass spectrometry were employed to determine the components in samples of solvent refined coal (SRC) II naphtha, middle distillate, heavy distillate, and fuel oil blend and SRC-I light oil, wash solvent, and process solvent in concentrations higher than approximately 0.5%. Quantitation was based on the addition of n-alkane internal standards and peak area response of a flame ionization detector with the use of fused silica and glass capillary columns coated with SE-52 and SF-96. The major differences in the SRC-I and II materials were the molecular weight ranges and sizes of the chemical components found in the products, and effect of the differences in the nominal boiling ranges of the materials. Alkanes, alkenes, hydroxylated aromatics, hydrogenated and polycyclic aromatic hydrocarbon ring systems, and alkylated derivatives of the above were found in greatest concentration in the unfractionated materials. Sulfur and nitrogen heteroatomic species were in greatest concentration in the higher nominal boiling range materials. A major purpose of these investigations was to develop a method to obtain data on the composition of these complex sample matrices for use in designing studies for toxicological evaluation of these materials. 26 references, 6 figures, 3 tables.

30726 **Identification of mutagens from the cooking of food.** Hatch, F.T.; Bjeldanes, L.F.; Felton, J.S.; Stuermer, D.H. (Lawrence Livermore National Lab., Univ. of California, Berkeley, CA). pp 111-164 of Chemical mutagens: principles and methods for their detection. de Serres, F.J. New York, NY; Plenum Press (1984).

This chapter reviews the formation of the pyrolytic and thermic mutagens, the isolation and identification methods that have been employed, and potential future improvements. The available data on chemical properties, organic synthesis, food analysis, and genetic toxicity are summarized. Topics considered include genotoxins in foods, sources of mutagens from the cooking of food, mutagens in cooked food (extraction, monitoring purification, fractionation and isolation, identification strategies, problems in analytical chemistry), identified thermic and pyrolytic mutagens, and the preliminary chemical classification of thermic and pyrolytic mutagens.

30727 **Cytotoxicity from coupled redox cycling of autoxidizing xenobiotics and metals: a selective critical review and commentary on work-in-progress.** Borg, D.C.; Schaich, K.M. (Brookhaven National Lab., Upton, NY). *Israel Journal of Chemistry;* 24: 38-53(1984).

A comprehensive reaction schema for oxidative cytotoxicity is presented, integrating known chemical mechanisms of oxygen radical reactions and observed pathophysiology. The key features of the schema are the coupling of (1) redox cycling of autoxidizable substrates to form the equilibrium pair of superoxide anion (O_2^-)/ and its conjugate acid, perhydroxyl radical (HO_2.); (2) hydrogen peroxide (H_2O_2) generation via O_2^- dimutation; (3) catalytic redox cycling of metals reducing H_2O_2 to reactive hydroxyl radicals (OH.); (4) direct reaction of OH. with target molecules, including critical cell macromolecules and polyunsaturated lipids in membranes; (5) transfer of oxidative potential from initial to distant sites via H_2O_2 and O_2-/HO_2 diffusion, lipid free radical chain peroxidations in membranes, and migration of non-radical lipid oxidation products; and (6) cytotoxic damage at those distant sites mediated by reaction of lipid radical species and other lipid oxidation products with critical target molecules (proteins, DNA, etc.). Although there is a broad consensus of agreement within the cognizant research community concerning many aspects of this schema, there exists considerable controversy and/or misconception about several important issues. Critical analyses of four presently controversial points are presented.

30728 **Forecasting effects of SO_2 pollution on growth and succession in a western conifer forest.** Kercher, J.R.; Axelrod, M.C.; Bingham, G.E. (Lawrence Livermore National Lab., CA). *U.S. Dept of Agriculture Forest Service Pacific Southwest Forest and range Experiment station;* 200-202(1980).

From Symposium on effects of air pollutants on Mediterranean and temperate forest ecosystems; Riverside, CA, USA (22-27 Jun 1980).

A simulator has been developed for the mixed conifer forest type of the Sierra Nevada, California to forecast the effects of SO_2 on forest growth and succession. The model simulates recruitment, growth, and death of each tree and is based on a northeastern USA simulator with extensive modifications. These modifications include the introduction of fire ecology, temporal seed crop patterns unique to the Sierra, and water stress. Pollutant stress is modeled as an effect on tree growth. The model simulates the shift from the ponderosa pine dominated forest type to the white fir dominated mixed conifer type as elevation increases from 5000 to 6000 ft. It also simulates the fire suppression of white fir and the fire-climax of ponderosa pine. For a 10% growth reduction of ponderosa pine from pollutant stress and with growth reductions in other species as determined by their relative sensitivities, standing crops of ponderosa pine were reduced and white fir increased. 9 references, 4 figures.

30729 **Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver.** Sunderman, F.W. Jr.; Zaharia, O.; Reid, M.C.; Belliveau, J.F.; O'Leary, G.P. Jr.; Griffin, H. (Univ. of Connecticut, Farmington). *Toxicology;* 1-6([1986]). Contract AC02-76EV03140.

Concentrations of reduced glutathione (GSH) and oxidized glutathione (GSSG) and 4 trace metals (Ni, Cu, Mn, Zn) were measured in livers from rats treated with sodium diethyldithiocarbamate (DDC, 0.67 or 1.33 mmol/kg, i.m.) and $NiCl_2$ (0.25 or 0.50 mmol/kg, s.c.), singly or in combination. In rats treated with DDC or $NiCl_2$, singly, hepatic GSH was diminished at 4 h and returned to control levels (or slightly above) at 17 h. In rats that received DDC plus $NiCl_2$, hepatic GSH was not diminished at 4 h and was increased 1.4-1.8-fold at 17 h. Hepatic GSSG was diminished at 4 h after $NiCl_2$ treatment and returned to control values at 17 h; hepatic GSSG did not differ from control values at 4 h or 17 h after treatment with DDC, alone or combined with $NiCl_2$. Hepatic Ni was below the detection limit (~20 nmol/g) in control and DDC-treated rats; hepatic Ni was increased to 53 +/- 26 (S.D.) nmol/g at 17 h after treatment with $NiCl_2$ alone, and was increased 6-fold (308 +/- 63 nmol/g) in rats that received Ni plus DDC. Under the same conditions, hepatic Zn was increased 33% or 41%, respectively, in rats that received $NiCl_2$ or DDC, singly, and was not further

increased by combined treatment: hepatic Cu and Mn concentrations were unaffected by $NiCl_2$ or DDC, singly, but were diminished in rats that received $NiCl_2$ and DDC. This study suggests: (a) that increased hepatic uptake of Ni is largely responsible for the synergistic induction of heme oxygenase activity in rats treated with $NiCl_2$ and DDC; and (b) that increased hepatic uptake of Zn contributes to the induction of hepatic metallothionein by $NiCl_2$ and DDC. 34 references, 2 tables.

5604 Other Environmental Pollutant Effects

30730 **(LA-tr—86-14) Memorandum - optical radiation danger when using RSV.** Hartmann, B.; Kleman, B. (Los Alamos National Lab., NM (USA); Radians Innova AB, Gothenburg (Sweden)). 1986. Contract W-7405-ENG-36. Translation source information not available . 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009143.

The measuring data are discussed and compared with the irradiation from a 3500 K cylinder with a 20 cm diameter. Following correction for the effect of the solid measuring angel on the radiation measurements, the radiation data measured and calculated agreed satisfactorily. The radiation danger was estimated in the following manner on the basis of the 3500 K model and the data obtained: (1) retinal burn injuries: no risk; (2) corneal or epidermal burn injuries: minor risk at a distance of >50 cm from the ray; and (3) blinding: recovery time a few seconds at high light intensity (daylight) inside a vehicle or 1 to 2 minutes at low light intensity (or in the dark). Longer burn times and higher radiation data reported from more recent experiments lead to increased risk for corneal and epidermal burns and longer recovery times after blinding. However, there is no basis for a quantitative treatment.

30731 **Ultrasound: biological effects and industrial hygiene concerns.** Wiernicki, C.; Karoly, W.J. (E.I. du Pont de Nemours and Co., Aiken, SC). *American Industrial Hygiene Association Journal;* 46: No. 9, 488-496(Sep 1985). Contract AC09-76SR00001.

Due to the increased use of high intensity ultrasonic devices, there is now a greater risk of worker exposure to ultrasonic radiation than there was in the past. Exposure to high power ultrasound may produce adverse biological effects. High power ultrasound, characterized by high intensity outputs at frequencies of 20-100 kHz, has a wide range of applications throughout industry. Future applications may involve equipment with higher energy outputs. Contact ultrasound, i.e., no air space between the energy source and the biological tissue, is significantly more hazardous than exposure to airborne ultrasound because air transmits less than one percent of the energy. This paper discusses biological effects associated with overexposure to ultrasound, exposure standards proposed for airborne and contact ultrasound industrial hygiene controls that can be employed to minimize exposure, and the instrumentation that is required for evaluating exposure.

30732 **Biological effects of electric fields: an overview.** Anderson, L.E.; Phillips, R.D. (Pacific Northwest Lab., Richland, WA). pp 345-378 of Biological effects and dosimetry of static and ELF electromagnetic fields. Grandolfo, M.; Michaelson, S.M.; Rindi, A. New York, NY; Plenum Press (1985). (CONF-831138—).

From International school of radiation damage and protection: biological effects and dosimetry of non-ionizing radiation; Erice, Italy (15 Nov 1983).

This paper investigates the biological consequences of exposure to ELF electromagnetic fields. Three important topics are discussed, including: the general methodology of exposure experiments, including those which are critical for definitive studies in biological systems; a brief discussion of epidemiological and clinical studies conducted to date; and a somewhat more extensive examination of animal experiments representing major areas of investigation (behavior, biological rhythms, nervous and endocrine chemistry, immunology, reproduction, growth and repair, cardiovascular system and blood chemistry, immunology, reproduction, growth and development, mortality and pathology, cellular and membrane studies, and mutagenesis. A discussion of current concepts and possible mechanisms are given. Future directions of research are presented.

30733 **Biological effects of stationary magnetic fields.** Tenforde, T.S. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA). pp 93-128 of Biological effects and dosimetry of static and ELF electromagnetic fields. Grandolfo, M.; Michaelson, S.M.; Rindi, A. New York, NY; Plenum Press (1985). (CONF-831138—).

From International school of radiation damage and protection: biological effects and dosimetry of non-ionizing radiation; Erice, Italy (15 Nov 1983).

A critical review is given of the magnetic field literature on the response of tissue and organ systems that involve ionic conduction processes, and the paper provides a general summary and critique of the literature related to the biological effects of magnetic fields. A discussion of current research is presented on the circadian physiology of animals exposed to large stationary magnetic fields.

30734 **Mechanisms for biological effects of magnetic fields.** Tenforde, T.S. (Lawrence Berkeley Lab., Univ. of California, Berkeley, CA). pp 71-92 of Biological effects and dosimetry of static and ELF electromagnetic fields. Grandolfo, M.; Michaelson, S.M.; Rindi, A. New York, NY; Plenum Press (1985). (CONF-831138—).

From International school of radiation damage and protection: biological effects and dosimetry of non-ionizing radiation; Erice, Italy (15 Nov 1983).

Two types of magnetic field interactions are described which have been demonstrated to occur in biological systems at the atomic and subatomic levels: the use of nuclear magnetic resonance for imaging proton density in living tissues, and the influence of Zeeman interactions on certain classes of electron transfer reactions. Electrodynamic and magnetohydrodynamic interactions are examined. Time-varying magnetic fields are discussed.

57 HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 30343, 30544, 30563

30735 **(CONF-8603100—1) Science, technology, and society.** Vaughen, V.C.A. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008228.

From Scientific Research Society Oak Ridge Chapter meeting; Oak Ridge, TN, USA (11 Mar 1986).

Subjects of this lecture are accidents, ethics, science, and risk analysis. (DLC)

30736 **(DOE/NV/10327—24) Cross-index to DOE-prescribed occupational safety codes and standards.** (Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA). Occupational Safety). Mar 1986. Contract AC08-84NV10327. 640p. NTIS, PC A99. File Number DE86009081.

This volume is the 1986 compilation of detailed information from more than four hundred and seventy DOE-prescribed or OSHA-referenced occupational safety codes, transportation safety codes, and fire protection codes and standards.

30737 **(ORNL/TM—9918) Respiratory Protection Program. Programmatic description.** Brooks, J.M.; Porter, W.E. (Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 50p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008416.

The ORNL Respirator Program is designed to provide employees with devices which afford maximum protection with minimum inconvenience and discomfort. Teamwork is essential since a comprehensive program involves the Medical Department, the Industrial Hygiene Department, Radiation and Safety Surveys, the Operations Division, Quality Assurance and Inspection, and the Fire Department. The purpose of this manual is to describe in detail the ORNL Respirator Program. Included are discussions of the following elements: quality assurance, selection, fit-testing, maintenance and issue, certified breathing air for self-contained breathing apparatus, inspection, program surveillance, available devices, and

standard operating procedures. As program modifications develop and improvements are made, periodic revisions may be necessary. The Industrial Hygiene Department will perform this task on an "as required" basis.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 29256, 29341, 29375, 29405, 29414, 29420, 30573, 30759

30738 **(BMI/ONWI—585) Evaluation of the structure and stratigraphy over Richton Dome, Mississippi.** Werner, M.L. (Earth Technology Corp., Long Beach, CA (USA)). May 1986. Contract AC02-83CH10140. 118p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86010255.

The structure and stratigraphy over Richton Salt Dome, Mississippi, have been evaluated from 70 borings that were completed to various depths above the dome. Seven lithologic units have been identified and tentatively correlated with the regional Tertiary stratigraphy. Structure-contour and thickness maps of the units show the effects of dome growth from Eocene through early Pliocene time. Growth of the salt stock from late Oligocene through early Pliocene is estimated to have averaged 0.6 to 2.6 centimeters (0.2 to 1.1 inches) per 1000 years. No dome growth has occurred since the early Pliocene. The late Oligocene to early Pliocene strata over and adjacent to the dome reflect arching over the entire salt stock; some additional arching over individual centers may represent pre-Quaternary differential movement in the salt stock. The lithology and structure of the caprock at the Richton Salt Dome indicate that the caprock probably was completely formed by late Oligocene. In late Oligocene, the caprock was fractured by arching and altered by gypsum veining. Since late Oligocene, there are no indications of significant hydrologic connections through the caprock - that is, there are no indications of dissolution collapse or further anhydrite caprock accumulation. This structural and stratigraphic analysis provides insights on dome growth history, dome geometry, and neardome hydrostratigraphy that will aid in planning site characterization field activities, including an exploratory shaft, and in the conceptual design of a high-level waste (HLW) repository.

30739 **(BMI/ONWI—587) Geostatistical analysis of potentiometric data in Wolfcamp aquifer of the Palo Duro Basin, Texas.** Harper, W.V.; Furr, J.M. (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Apr 1986. Contract AC02-83CH10140. 108p. NTIS, PC A06/MF A01; 1; GPO Dep. File Number DE86010226.

This report details a geostatistical analysis of potentiometric data from the Wolfcamp aquifer in the Palo Duro Basin, Texas. Such an analysis is a part of an overall uncertainty analysis for a high-level waste repository in salt. Both an expected potentiometric surface and the associated standard error surface are produced. The Wolfcamp data are found to be well explained by a linear trend with a superimposed spherical semivariogram. A cross-validation of the analysis confirms this. In addition, the cross-validation provides a point-by-point check to test for possible anomalous data.

30740 **(EEG—32) Rustler Formation as a transport medium for contaminated groundwater.** Chaturvedi, L.; Channell, J.K. (New Mexico Health and Environment Dept., Santa Fe (USA). Environmental Evaluation Group). Dec 1985. Contract AC04-78AL10752. 200p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86007804.

The WIPP repository is being excavated in the lower part of the 2000 ft thick Salado Formation, 2150 ft below the ground surface. The water-bearing zones in the Rustler Formation, which overlies the Salado, are considered to be the main pathway for the transport of radionuclides to the biosphere after a potential breach of the WIPP repository. Geological nd hydrological characterization of the Rustler Formation has not yet been completed to a desired level of detail for a realistic modeling of breach and transport scenarios through this Formation. Currently, the Department of Energy is conducting studies which will significantly enhance our knowledge about the suitability of the Rustler Formation to act as a barrier against the movement of radionuclide contaminated water. A sedimentological study of the cores from several boreholes will help establish the causes for the absence of salt from the Rustler Formation. Several multi-well flow tests over the WIPP site will yield more reliable values for the hydrologic parameters. Rustler water-chemistry data will help in more accurately establishing the flow directions and the pattern of interconnections. In addition to analyzing the geological conditions which affect the hydrological characteristics of the Rustler Formation, this report contains an analysis of radionuclide transport through a Rustler water-bearing zone which is assumed to contain karst conduits. 54 refs., 18 figs., 4 tabs.

30741 **(ORNL—6148) Automated sensitivity analysis using the GRESS language.** Pin, F.G.; Oblow, E.M.; Wright, R.Q. (Oak Ridge National Lab., TN (USA)). Apr 1986. Contract AC05-84OR21400. 91p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE86010064.

An automated procedure for performing large-scale sensitivity studies based on the use of computer calculus is presented. The procedure is embodied in a FORTRAN precompiler called GRESS, which automatically processes computer models and adds derivative-taking capabilities to the normal calculated results. In this report, the GRESS code is described, tested against analytic and numerical test problems, and then applied to a major geohydrological modeling problem. The SWENT nuclear waste repository modeling code is used as the basis for these studies. Results for all problems are discussed in detail. Conclusions are drawn as to the applicability of GRESS in the problems at hand and for more general large-scale modeling sensitivity studies.

30742 **(SAND—85-0855) Fluid flow in a fractured rock mass.** Klavetter, E.A.; Peters, R.R. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1986. Contract AC04-76DP00789. 61p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009981.

The geological formations in the unsaturated zone underlying Yucca Mountain, on and adjacent to the Nevada Test Site, are being evaluated by the Nevada Nuclear Waste Storage Investigations project. The formations are being considered as host media for a radioactive-waste repository. They are composed of tuffaceous materials, sometimes highly fractured, whose hydrologic properties must be evaluated to estimate the rate at which radionuclides could migrate to the accessible environment. Hydrologic flow models used for postclosure performance assessment of the prospective repository must take into account the potential for water movement in both the rock matrix and the fractures. Calculations using models that explicitly account for the effects of individual fractures are not feasible, because of the extremely large number of fractures contained in a site-scale problem and the difficulties in characterizing and modeling the fracture geometries. Two approaches were used to develop a continuum model to evaluate water movement in a fractured rock mass. Both approaches assume that the pressure heads in the fractures and the matrix are identical along a line perpendicular to flow. The first approach uses this assumption and separate equations for flow in the fractures and in the matrix to derive both a single flow equation for an equivalent, porous medium and mathematical expressions for the unsaturated, hydrologic properties in this flow equation. the second approach assumes a fluid continuity equation for a porous medium. Information on the physical structure of the rock mass, along with theoretical considerations from capillary theory, is used to derive the mathematical expressions for the rock-mass unsaturated hydrologic properties. Both approaches lead to a single flow equation for a fractured rock mass.

30743 **(TVA/ONRED/AWR—85/32) Floods on North Toe River and Beaver, Grassy, and East Fork Grassy Creeks in the vicinity of Spruce Pine, North Carolina.** (Tennessee Valley Authority, Knoxville (USA). Office of Natural Resources and Economic Development). Sep 1985. 66p. NTIS, PC A04/MF A01. File Number DE86901268.

This flood hazard information report describes the extent and severity of the flood potential along selected reaches of the

North Toe River and Beaver, Grassy, and East Fork Grassy Creeks in the vicinity of Spruce Pine, North Carolina. It was prepared in response to a request by the town for up-to-date information regarding the flood potential along the studied stream reaches in order to better administer the local floodplain management program.

30744 **(USGS-PP—1329) Vegetation and climates of the last 45,000 years in the vicinity of the Nevada Test Site, south-central Nevada.** (Geological Survey, Reston, VA (USA)). 1985. Contract AI08-78ET44802. 87p. NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE86008699.

Major changes in the climate of the Nevada Test Site have occurred during the last 45,000 years. Understanding this climate variability is important in assessing the region's suitability for permanent nuclear-waste repositories. Future climatic changes probably will occur within the time the waste materials are hazardous. The nature and magnitude of previous fluctuations indicate the nature of future climatic change that may impact on a nuclear waste repository. Reconstructions of past vegetation are used to infer climatic conditions during the past 45,000 years. Plant macrofossils from ancient packrat (Neotoma spp.) middens provide the data for these analyses. Middens can be older than 50,000 years, and they are common in the region. Each contains abundant mummified plant fossils, representing the plant species growing within about 30 meters of the site. Radiocarbon-dated midden samples provide detailed records of climate-induced vegetation change. Increased atmospheric carbon dioxide within the next 500 years probably will result in a 2°to 3°C increase in annual temperature and intensified rainfall in the Nevada Test Site region. Analogs with previous glacial-interglacial cycles indicate that this "superinterglacial" may be no more than a relatively brief reversal in the protracted trend toward the next ice age. Current models indicate that, within the next 10,000 years, climatic conditions may be similar to those of the last glacial age.

30745 **(USGS/WRI—84-4296) Inflow to a crack in playa deposits of Yucca Lake, Nevada Test Site, Nye County, Nevada.** Doty, G.C.; Rush, F.E. (Geological Survey, Denver, CO (USA). Water Resources Div.). 1985. Contract AI08-76DP00474. 28p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86008811.

A crack about 1 mile long opened in 1969 in the dry bed of Yucca Lake, a playa on the Nevada Test Site. Accumulation of water from precipitation on the lakebed drained rapidly into the crack and led to concern whether the water entering the crack was directly recharging the very transmissive Paleozoic carbonate comprising the aquifer for the regional flow system. If so, runoff from nearby areas for past surface testing of nuclear devices possibly could contribute residual radioactive contaminants directly to the regional flow system by draining into this and similar cracks. An effort was made to determine the quality of water entering the crack by installing 10 Parshall flumes in a berm surrounding the crack and by monitoring inflow for about 3 years. Flow records from the flumes indicate that an estimated 5 million cubic feet of water flowed into the crack during the period of measurements. Results of one sample of water analyzed for chemical constituents and of several samples analyzed for radioactivity indicate that the water that entered the crack constituted no human-health hazard. In the event another crack opens in the lakebed, and if additional study is undertaken, an improved method of monitoring inflows would result in better records and improved understanding of these cracks.

5802 Geophysics

REFER ALSO TO CITATION(S) 29232, 30518, 30740

30746 **(CONF-8506104—3) Computer method to detect and correct cycle skipping on sonic logs.** Muller, D.C. (Geological Survey, Denver, CO (USA)). 17 Jun 1985. Contract AI08-78ET44802. 19p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008249.

[illegible] Society of Professional Well Log Analysts annual logging symposium; Dallas, TX, USA (17 Jun 1985).

A simple but effective computer method has been developed to detect cycle skipping on sonic logs and to replace cycle skips with estimates of correct traveltimes. The method can be used to correct observed traveltime pairs from the transmitter to both receivers. The basis of the method is the linearity of a plot of theoretical traveltime from the transmitter to the first receiver versus theoretical traveltime from the transmitter to the second receiver. Theoretical traveltime pairs are calculated assuming that the sonic logging tool is centered in the borehole, that the borehole diameter is constant, that the borehole fluid velocity is constant, and that the formation is homogeneous. The plot is linear for the full range of possible formation-rock velocity. Plots of observed traveltime pairs from a sonic logging tool are also linear but have a large degree of scatter due to borehole rugosity, sharp boundaries exhibiting large velocity contrasts, and system measurement uncertainties. However, this scatter can be reduced to a level that is less than scatter due to cycle skipping, so that cycle skips may be detected and discarded or replaced with estimated values of traveltime. Advantages of the method are that it can be applied in real time, that it can be used with data collected by existing tools, that it only affects data that exhibit cycle skipping and leaves other data unchanged, and that a correction trace can be generated which shows where cycle skipping occurs and the amount of correction applied. The method has been successfully tested on sonic log data taken in two holes drilled at the Nevada Test Site, Nye County, Nevada.

30747 **(LBL—20020) Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings.** Sorey, M.L.; Farrar, C.D.; Wollenberg, H.A. (Geological Survey, Menlo Park, CA (USA); Geological Survey, Santa Rosa, CA (USA); Lawrence Berkeley Lab., CA (USA)). Oct 1984. Contract AC03-76SF00098. 87p. (CONF-8410373—). NTIS, PC A05/MF A01; 1; GPO Dep. File Number DE86009343.

From Workshop on hydrologic geochemical monitoring in the Long Valley caldera; Mammoth Lakes, CA, USA (8 Oct 1984).

A workshop reviewed the results of hydrologic and geochemical monitoring in the Long Valley caldera. Such monitoring is being done to detect changes in the hydrothermal system induced by ongoing magmatic and tectonic processes. Workshop participants discussed the need to instrument sites for continuous measurements of several parameters and to obtain additional hydrologic and chemical information from intermediate and deep drill holes. In addition to seismic and deformation monitoring, programs are currently in progress to monitor changes in the discharge characteristics of hot springs, fumaroles, and soil gases, as well as pressures and temperatures in wells. Some hydrochemical parameters are measured continuously, others are measured monthly or at longer intervals. This report summarizes the information presented at the hydrologic monitoring workshop, following the workshop agenda which was divided into four sessions: (1) overview of the hydrothermal system; (2) monitoring springs, fumaroles, and wells; (3) monitoring gas emissions; and (4) conclusions and recommendations.

30748 **(USGS-OFR—86-46) Preliminary analysis of geophysical logs from the WT series of drill holes, Yucca Mountain, Nye County, Nevada.** Muller, D.C.; Kibler, J.E. (Geological Survey, Denver, CO (USA)). 1985. Contract AI08-78ET44802. 54p. NTIS, PC A04/MF A01; GPO Dep. File Number DE86010153.

Geophysical logs from the WT series of drill holes correlate well with similar logs from other drill holes at Yucca Mountain, Nevada, in the unsaturated zone through the same geologic units. The in-situ physical properties of the rocks from well logs are consistent with laboratory-measured physical properties of core from other drill holes. The Topopah Spring Member is concluded to have zones that are highly fractured and lithophysal in holes where the density and neutron longs are very "spiky" as noted in other cored drill holes. Low levels on the uranium trace from the spectral gamma-ray log indicate that fractures are neither healed nor filled with materials that concentrate uranium. Therefore, fracture permeability is expected to be high. This conclusion is consistent with fracture analysis from other drill holes on Yucca Mountain. The dielectric constant and dielectric resistivity logs correlate well

with the epithermal neutron, borehole compensated density, and induction resistivity logs in the unsaturated zone.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 29250, 29251, 29252, 29264, 29415, 29418, 30742

30749 (SAND—85-0123C) Expected thermal and hydrothermal environments for waste emplacement holes based on G-tunnel heater experiments. Zimmerman, R.M.; Blanford, M.L. (Sandia National Labs., Albuquerque, NM (USA); RE/SPEC, Inc., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 9p. (CONF-860609—9). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007826.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

The focus in this paper is to present the results and evaluations of the experiments as they apply to improving predictive capabilities. The thermal aspects are emphasized by comparing the measured temperatures (in and around heater emplacement holes) with calculations of predicted temperatures using numerical models, so that the effects of significant parameters can be evaluated and integrated into future predictive models. The conclusions regarding the expected environments for the waste emplacement holes are as follows: (1) The thermal environment for the rock forming the outer boundary of the waste package system is governed by heat-transfer phenomena that can be modeled with reasonable accuracy using empirical material property descriptions for the rock. (2) The hydrological environment in the emplacement hole appears to be governed by psychrometric phenomena at ambient pressures. There is a tendency for pore water to migrate in vapor form towards the heater and then equilibrate to the pressure and temperature conditions. (3) The hydrothermal phenomena in the rock outside the emplacement hole appeared to be predominantly vapor water migration away from the boiling region with later liquid migration into the rock. Flow directions around the boiling region appeared to be governed by in situ geological conditions.

30750 (SAND—85-2124C) Geotechnical properties of fine-grained turbidite sequences: observations from the Nares Abyssal Plain. Shephard, L.E.; Rutledge, A.K.; Bryant, W.R.; Moran, K.M. (Sandia National Labs., Albuquerque, NM (USA); Texas A and M Univ., College Station (USA). Dept. of Oceanography; Bedford Inst. of Oceanography, Dartmouth, Nova Scotia (Canada)). 15 Jan 1986. Contract AC04-76DP00789. 49p. (CONF-860165—1). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009024.

From Geology and geochemistry of abyssal plains symposium; London, UK (1 Jan 1986).

Variations in the geotechnical properties of fine-grained turbidite sequences located in the Nares Abyssal Plain appear directly related to the dominant processes controlling sediment deposition. Changes in the index properties are gradational from the turbidite bases, often containing silt beds or laminae, upwards through the chemically laminated possibly turbiditic clays and into the nonturbiditic pelagic and hemipelagic clays. The depth at which consolidation processes begin to control the distribution of geotechnical properties is unclear; however, it is apparent that depositional processes predominate to depths of 3 to 4 meters. Consolidation test results indicate that abyssal plain sediments appear normally to overconsolidated using standard soil mechanics terminology and methods. Clay fabric analyses using transmission electron microscopy show significant variations in grain size, grain type, and orientation between the turbiditic and nonturbiditic clays.

30751 (SAND—85-2237C) Early results from the thermal/structural in situ test series at the WIPP. Munson, D.E.; Torres, T.M.; Blankenship, D.A. (Sandia National Labs., Albuquerque, NM (USA); RE/SPEC, Inc., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 9p. (CONF-860609—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007390.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

The Thermal/Structural Interactions (TSI) In Situ Tests are a series of large-scale, well instrumented tests that have been constructed at the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico. As a precursor to the TSI tests, a ventilation drift (Room D) was mined, drilled and instrumented. This room provided the contractor an excellent area to practice controlled construction methods and was proving ground for construction monitoring and documentation methods. All gages in this first room have been monitored since their initial installation, which has provided a small, but representative, data base. These data also were the first to be available from any TSI area for analysis. This paper discusses the construction activities in Room D and the data generated from the construction and drilling. Deformation of the room is compared briefly to numerical calculations that used a rather simple creep model as a reference. The constitutive model for salt, it appears, must be improved before it can predict the underground deformations.

30752 (SAND—85-2238C) Comparison between predicted and measured south drift closures at the WIPP using a transient creep model for salt. Munson, D.E.; Fossum, A.F. (Sandia National Labs., Albuquerque, NM (USA); RE/SPEC, Inc., Rapid City, SD (USA)). 1986. Contract AC04-76DP00789. 10p. (CONF-860609—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007147.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

The US Department of Energy is constructing and operating the Waste Isolation Pilot Plant (WIPP), a research and development facility near Carlsbad, New Mexico, to determine whether or not defense-generated high-level radioactive waste can be stored safely in bedded salt. The goal of the WIPP modeling program is to develop the capability to predict room responses from one site to another without a priori knowledge of the actual room responses. Data from one of the early WIPP excavations, called the South Drift, have already been used to form an initial evaluation of computational models for predicting room closures as a result of salt creep. In that study, a significant unresolved discrepancy existed between predicted and measured room closures. It was suggested that future studies address alternate forms of the constitutive law. In this paper, an alternate form of the creep model for salt is used that is founded upon the deformation-mechanism map for the micromechanical deformation processes. This model embodies both steady-state and transient creep. Also, quasi-static plasticity is incorporated into the complete constitutive model for salt. The conclusion is drawn that the combination of the mechanistic creep model, plasticity, and flow potential can approximate the late time South Drift deformation. Further improvement of the model fit of plasticity in the future is expected to further improve the simulation.

30753 (SAND—85-2273C) Experience with hydraulic fracturing tests for stress measurements in the WIPP. Wawersik, W.R.; Stone, C.M. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 21p. (CONF-860609—4). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007388.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

Hydraulic fracturing tests around the WIPP in the Salado salt formation near Carlsbad, New Mexico, demonstrated that the virgin in situ stress state is isotropic and that the stress magnitude corresponds to the weight of the overburden. It was also determined, however, that hydraulic fracturing in rock salt does not render stress measurements directly because all characteristic test pressures are strongly influenced by creep. In this study, the correlation between fracturing pressures and in situ stresses was made by means of finite element analyses and by means of in situ observations of all hydraulically induced fracture patterns. Because of creep, it also appears that the shapes of the pressure-time records in rock salt will be very different from the normal shapes of hydraulic fracturing records in competent hard rock. In particular, (1) stable pressure-time signatures with no distinct change from breakdown to driving pressures are obtained under isotropic far-field loading, (2) instantaneous shut-in pressures are likely to be obscured by fracture pinching, and (3) pressure-time signatures will change with delay time between drilling and hydraulic fracturing for approximately the first 50 days. After that time, a relatively long window appears to open up during which the predicted stress fields around the drill-

hole are approximately constant. The present results should apply qualitatively to hydraulic fracturing at other sites. However, local differences such as brinehead pressures should be taken into account.

30754 **(SAND—86-0238) Elastic and viscoelastic model of the stress history of sedimentary rocks.** Warpinski, N.R. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1986. 122p. NTIS, PC A06/MF A01. File Number DE86009980.

A model has been developed to calculate the elastic and viscoelastic stresses which develop in rocks at depth due to burial, uplift and diagenesis. This model includes the effect of the overburden load, tectonic or geometric strains, thermal strains, varying material properties, pore pressure variations, and viscoeleastic relaxation. Calculations for some simple examples are given to show the contributions of the individual stress components due to gravity, tectonics, thermal effects and pore pressure. A complete stress history for Mesaverde rocks in the Piceance basin is calculated based on available burial history, thermal history and expected pore pressure, material property and tectonic strain variations through time. These calculations show the importance of including material property changes and viscoelastic effects. 15 refs., 48 figs.

30755 **(SAND—86-0412C) Three dimensional modeling of the wedge pillar portion of the WIPP Geomechanical Evaluation (Room G) in situ experiment.** Preece, D.S. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 7p. (CONF-860609—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007394.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

Pretest 3-D finite element creep calculations of the WIPP wedge pillar experiment have been performed. The calculation shows that the horizontal closure of the drifts on either side of the wedge pillar increase with distance from the tip of the wedge. Vertical closure is greatest at the tip of the wedge and smaller, though not significantly smaller, at the opposite end. The relative shift of the drift walls parallel to the drift axis is greatest at the wedge pillar tip and drops off rapidly with distance along the pillar. At distances of approximately one drift width the parallel shift is small enough that the configuration could be analyzed with a 2-D plane strain model. The results of 2-D plane strain calculations at one station of the 3-D model compare very well with 3-D results (deviations $\leq$1%). Maximum horizontal closures along the wedge pillar are approximately twice those calculated from a 2-D plane strain single drift model of Morgan and Stone, 1985 that includes stratigraphy. Maximum vertical closures are approximately 1.5 times those obtained from the single drift model. Stresses calculated assuming instantaneous drift creation on both sides of the pillar indicate that wedge pillar failure can be expected at the wedge pillar tip. The distance the failure will propagate is difficult to quantify since the material models did not include a failure criterion. Also the stresses predicted are probably higher than what could be expected with a realistic simulation of the mining sequence.

30756 **(UCRL—93421) Thermomechanical modeling of the Spent Fuel Test-Climax.** Butkovich, T.R.; Patrick, W.C. (Lawrence Livermore National Lab., CA (USA); I. T. Corp., Carlsbad, NM (USA)). Feb 1986. Contract W-7405-ENG-48. 10p. (CONF-860609—12). NTIS, PC A02. File Number DE86009699.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

The Spent Fuel Test-Climax (SFT-C) was conducted to evaluate the feasibility of retrievable deep geologic storage of commercially generated spent nuclear-reactor fuel assemblies. One of the primary aspects of the test was to measure the thermomechanical response of the rock mass to the extensive heating of a large volume of rock. Instrumentation was emplaced to measure stress changes, relative motion of the rock mass, and tunnel closures during three years of heating from thermally decaying heat sources, followed by a six-month cooldown period. The calculations reported here were performed using the best available input parameters, thermal and mechanical properties, and power levels which were directly measured or inferred from measurements made during the test. This report documents the results of these calculations and compares the results with selected measurements made during heating and cooling of the SFT-C.

30757 **(UCRL—93422) Inelastic deformations of fault and shear zones in granitic rock.** Wilder, D.G. (Lawrence Livermore National Lab., CA (USA)). Feb 1986. Contract W-7405-ENG-48. 8p. (CONF-860609—11). NTIS, PC A02. File Number DE86008767.

From 27. U.S. symposium on rock mechanics; Tuscaloosa, AL, USA (23 Jun 1986).

Deformations during heating and cooling of three drifts in granitic rock were influenced by the presence of faults and shear zones. Thermal deformations were significantly larger in sheared and faulted zones than where the rock was jointed, but neither sheared nor faulted. Furthermore, thermal deformations in faulted or sheared rock were not significantly recovered during subsequent cooling, thus a permanent deformation remained. This inelastic response is in contrast with elastic behavior identified in unfaulted and unsheared rock segments. A companion paper indicates that deformations in unsheared or unfaulted rock were effectively modeled as an elastic response. We conclude that permanent deformations occurred in fractures with crushed minerals and fracture filling or gouge materials. Potential mechanisms for this permanent deformation are asperity readjustments during thermal deformations, microshearing, asperity crushing and crushing of the secondary fracture filling minerals. Additionally, modulus differences in sheared or faulted rock as compared to more intact rock would result in greater deformations in response to the same thermal loads.

5804 Geochemistry

REFER ALSO TO CITATION(S) 29231, 29428, 29441, 30747

30758 **(DOE/ER/13112—3) Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985.** Hanson, G.N.; Meyers, W.J. (State Univ. of New York, Stony Brook (USA). Dept. of Earth and Space Sciences). Feb 1986. Contract AC02-83ER13112. 15p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009317.

Geochemical studies have included Sr, C, O and Nd isotope and REE analyses of the major generations of dolomite and calcite cements as well as shaly zones within the mid-Mississippian Burlington-Keokuk Formations, which are exposed over an area of 80,000 km^2 in Iowa, Illinois and Missouri. Timing of the four major generations of dolomites based on petrographic relations show that they formed during the Mississippian. Significant differences are observed in the isotopic compositions of C, O and Sr, as well as in Sr abundances in the different generations of dolomite. The earliest dolomite has C, O and Sr isotope values close to the range expected for dolomite precipitated in seawater during Osagean time. The later dolomites have higher $^{87}Sr/^{86}Sr$ ratios, lower $d^{18}O$ and similar $d^{13}C$ values. The REE for the major dolomite generations show a narrow range of pattern shapes and abundances. The shapes are similar to those expected for carbonates precipitated from Osagean seawater. The Nd isotope ratios for the dolomites also show a small range and are identical to those of the associated clastic sediments. It appears that later fluids did not significantly change the Nd isotope ratios or the REE patterns for the dolomites.

30759 **(DOE/ER/13259—T2) Thermally induced chemical migration: a natural analog approach. [Technical progress report].** Papike, J.J. (South Dakota School of Mines and Technology, Rapid City (USA). Inst. for the Study of Mineral Deposits). 18 Apr 1986. Contract FG01-84ER13259. 55p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009034.

The objective was to understand Proterozoic granite systems in the Black Hills. Some results are outlined: (1) Source region: Nd, O, and Sr isotope characteristics indicate that the Harney Peak Granite was not derived from any sampled Proterozoic metasedimentary rock exposure in the region. The granite and the pegmatite were either derived from a single source whose average precursor became LREE-enriched during late-Archean, or they were derived from at least two sources with at least one endmember of the source having a late Archean or older mantle extraction age. (2)

The Harney Peak Granite-pegmatite connection: We considered four models in our geochemical modeling: (a) crystallization from a silicate melt derived from a one-stage anatexis event; (b) crystallization from a fluid produced by exsolution from the granite or by metamorphic dehydration of metasediments; (c) a model which concerns melt scavenging of the elements enriched in pegmatites (e.g. Li, Rb, Cs) from fluids or rocks with which it comes in contact; (d) crystallization from a melt derived through some fractionation of the Harney Peak Granite. (3) Emplacement mechanism: The Calamity Peak layered complex is a satellitic composite pluton (~1 km^2) with many structural, textural, and chemical features mimicking the larger (~100 km^2) Harney Peak dome. The Calamity Peak dome (and by inference parts of the Harney Peak dome) grew by repeated conformable intrusions of granitic layers on the hanging-wall side of the initial intrusion. (4) Pegmatite internal evolution: major, minor, trace elements, and oxygen isotope compositions have been evaluated to delineate the sequence of crystallization in the zoned and highly fractionated Tin Mountain pegmatite.

30760 (SRO—819-16, pp 4-11) **Division of Biogeochemical Ecology FY-1985 highlights.** Sep 1985. NTIS, PC A08/MF A01. File Number DE86005256.

In Ecological research at the Savannah River Ecology Laboratory. Annual report for the period ending July 31, 1985.

The primary goal of the Division is to understand the various biogeochemical processes, both in aquatic and terrestrial systems, that occur in the southeastern United States, including the Savannah River Plant. Both applied and basic approaches are being used to enhance understanding of the biogeochemical cycles of certain elements and trace contaminants, either in inorganic or organic states, and in stable or radioactive forms. Specific examples of studies conducted during the past year include: (1) ecosystem modeling and implementation of a computer model to predict the fate, behavior and transport of heavy metals and radionuclides in SRP streams, (2) laboratory and greenhouse studies on the environmental chemistry of an organo-borate in the soil-plant system, (3) research on the behavior and fate of actinide elements and other long-lived radioisotopes in terrestrial and aquatic ecosystems, and (4) responses of pine plantations to organic waste fertilization. Major findings of these studies are summarized. The chemical speciation-transport model MEXAMS (Metal Exposure Analysis Modeling System) was implemented to provide predictive capabilities for the transport of heavy metals and radionuclides in SRP aquatic systems. The basic components of the model are the geochemical model MINTEQ, and an aquatic exposure assessment model, EXAMS. The interfacing of these two models provides information on the complex chemistry and behavior of metals, as well as the transport processes influencing their migration and ultimate fate in aquatic systems. Test simulations for Cd, Cu, and Ni speciation in various SRP streams were conducted. The results indicated that the MEXAMS model will be a useful tool in predicting the transport and fate of metals in SRP streams.

30761 (UCRL—15790) **Permeability and pore-fluid chemistry of the Bullfrog Tuff in a temperature gradient: summary of results.** Byerlee, J.; Morrow, C.; Moore, D. (Geological Survey, Menlo Park, CA (USA)). Jun 1983. Contract W-7405-ENG-48. 28p. (SANL—231-003; USGS-OFR—83-475). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009689.

In order to study the changes that take place with time when groundwater comes in contact with heated rock, and to determine the ease with which potential radionuclide-bearing groundwater could be carried into the environment, the permeability and fluid chemistry of the Bullfrog Tuff from Yucca Mountain were studied under conditions simulating a nuclear waste repository environment. (ACR)

5805 Oceanography

REFER ALSO TO CITATION(S) 30750

64 PHYSICS I

30762 (DOE/ER—0191/3) **Programs of the Office of Energy Research.** (USDOE Office of Energy Research, Washington, DC). Apr 1986. 28p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009937.

The programs of the Office of Energy Research, DOE, include several thousand individual projects and hundreds of laboratories, universities, and other research facilities throughout the United States. The major programs and activities are described briefly, and include high energy and nuclear physics, fusion energy, basic energy sciences, and health and environmental research, as well as advisory, assessment, support, and scientific computing activities. (LEW)

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 30424, 30829, 30835

30763 (FNAL/Pub—86/36-A) **Finite temperature instability for compactification.** Accetta, F.S.; Kolb, E.W. (Chicago Univ., IL (USA). Enrico Fermi Inst.; Fermi National Accelerator Lab., Batavia, IL (USA)). Mar 1986. Contract AC02-76CH03000. 20p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009992.

We consider finite temperature effects upon theories with extra dimensions compactified via vacuum stress energy (Casimir) effects. For sufficiently high temperature, a static configuration for the internal space is impossible. At somewhat lower temperatures, there is an instability due to thermal fluctuations of radius of the compact dimensions. For both cases, the Universe can evolve to a de Sitter-like expansion of all dimensions. Stability to late times constrains the initial entropy of the universe. 28 refs., 1 fig., 2 tabs.

30764 (FNAL/Pub—86/47-A) **Probing the structure of the galactic halo with gamma rays produced by WIMP annihilations.** Turner, M.S. (Fermi National Accelerator Lab., Batavia, IL (USA); Chicago Univ., IL (USA). Enrico Fermi Inst.). Mar 1986. Contract AC02-76CH03000. 14p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009990.

It has recently been pointed out that the annihilations of a class of possible dark matter halo constituents (including photinos, higgsinos, and heavy neutrinos or sneutrinos) within the halo of our galaxy produce a series of narrow gamma-ray lines. If these lines are detected, then the directional dependence of the intensity of the lines provides a very powerful probe of the halo mass distribution, and the local density, core radius, and ellipticity of the halo could be readily determined. We briefly comment on the possibility of detecting WIMP annihilations in the galactic spheroid. 10 refs., 3 figs.

30765 (FNAL/Pub—86/48-A) **Effect of inflation on anisotropic cosmologies.** Jensen, L.G.; Stein-Schabes, J.A. (Fermi National Accelerator Lab., Batavia, IL (USA)). Mar 1986. Contract AC02-76CH03000. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009993.

The effects of anisotropic cosmologies on inflation are studied. By properly formulating the field equations it is possible to show that any model that undergoes sufficient inflation will become isotropic on scales greater than the horizon today. Furthermore, we shall show that it takes a very long time for anisotropies to become visible in the observable part of the Universe. It is interesting to note that the time scale will be independent of the Bianchi Model and of the initial anisotropy. 6 refs.

30766 **(FNAL/Pub—86/49-A) Bianchi models and new inflation.** Turner, M.S.; Widrow, L. (Fermi National Accelerator Lab., Batavia, IL (USA); Chicago Univ., IL (USA). Dept. of Physics). Mar 1986. Contract AC02-76CH03000. 12p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009988.

The promise of the inflationary Universe scenario is to free the present state of the Universe from extreme dependence on initial data. Paradoxically, inflation is usually analyzed in the context of the homogeneous and isotropic Robertson-Walker (RW) cosmological models. We show that all but a small subset of the homogeneous models (the Bianchi models) undergo inflation. Any initial anisotropy is so strongly damped that if sufficient inflation occurs to solve the flatness/horizon problems the Universe today would still be very isotropic. Some of the Bianchi models will eventually (in the exponentially distant future) become very anisotropic again. 15 refs.

30767 **(FNAL/Pub—86/57-A) Non-static vacuum strings: exterior and interior solutions.** Stein-Schabes, J.A. (Fermi National Accelerator Lab., Batavia, IL (USA); Sussex Univ., Brighton (UK). Astronomy Centre). Jan 1986. Contract AC02-76CH03000. 14p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009987.

New non-static cylindrically symmetric solutions of Einsteins's equations are presented. Some of these solutions represent string-like objects. An exterior vacuum solution is matched to a non-vacuum interior solution for different forms of the energy-momentum tensor. They generalize the standard static string. 12 refs.

30768 **(IC—85/35) Cosmic numbers and quantum theory.** Tarski, J. (International Centre for Theoretical Physics, Trieste (Italy)). Apr 1985. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701775.

The cosmic numbers are considered, with emphasis on the relation N approx.= rho^3. (Here N is the number of nucleons in the universe, and rho, its radius in atomic units). This relation is interpreted in terms of a quantum-mechanical model.

30769 **(IC—85/47) Universe created from 'nothing' as a broken symmetry theory of gravity.** Pollock, M.D. (International Centre for Theoretical Physics, Trieste (Italy)). May 1985. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701776.

The probability for the universe to have been created from 'nothing' in a state with Euclidean action Ssub(E) is known to be P=A exp(-chemical bondSsub(E)chemical bond). Starting from a broken symmetry theory of gravity, with Lagrangian density L=(1/2)epsilonphi^{2}R+(1/2)phisub(;k)phisup(;k)-V(phi)+βR^{2}ln(R/μ^2), we construct a quasi-de-Sitter space-time which corresponds to the most likely configuration, with Ssub(E)=0, and whose vacuum energy density is within the limits set by observations of the anisotropy of the cosmological microwave background radiation.

30770 **(IFT-P—14/85) Multiple images of our galaxy in closed, multiply connected cosmologies.** Fagundes, H.V. (Instituto de Fisica Teorica, Sao Paulo (Brazil)). 1985. 3p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701777.

Friedmanian cosmology with multiply connected spatial sections allows multiple images of cosmic sources, in particular of the galaxy itself. This is illustrated with a specific example of a closed hyperbolic model and a brief mention of a spherical model. Such images may eventually become observable (or recognized as such), thus providing a new test of relativistic cosmology.

30771 **(KEK—84-12, pp 201-210) Point source of very high energy gamma ray.** Kifune, T. (Tokyo Univ., Tanashi, Japan. Inst. for Cosmic Ray Research). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Recent experiments show the positive evidences of point sources of very high energy gamma rays above 10^{12}eV. In the energy region of 10^{1516}eV, the most reliable evidences are found on Cyg X-3 among the reported sources. A brief review of the experimental works on the source is introduced. The emission mechanism of very high energy gamma ray in Cyg X-3 is also discussed. Intensive fluxes of cosmic ray proton at the source can explain the observed value of the gamma ray flux. This indicates the possibility that the high energy cosmic ray particles are originated at the point source of very high energy gamma ray.

30772 **(KEK—84-12, pp 122-130) Recent observations of the galactic center.** Inatani, Junji. (Tokyo Univ., Nobeyama, Nagano, Japan. Nobeyama Radio Observatory). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Recent observational topics on the galactic center are briefly reviewed. Main interest is gas conditions in the vicinity of the nucleus. A rapidly rotating molecular cloud and a spiral-like ionized gas are proposed to be in an intimate physical correlation.

30773 **(KEK—84-12, pp 148-168) Current status of missing mass problem.** Takahara, Fumio. (Tokyo Univ., Nobeyama, Nagano, Japan. Nobeyama Radio Observatory). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Current status of missing mass problem is reviewed with emphasis on recent progress in observational cosmology. Topics include mass to light ratios of astronomical objects of various scales, infall of the local group of galaxies towards the Virgo cluster and the redshift survey of galaxies. Problems with nucleonic and non-nucleonic matter as candidates for missing mass are discussed. It is concluded that non-nucleonic matter dominates at least on scales larger than rich clusters of galaxies.

30774 **(KEK—84-12, pp 275-286) Scenarios of galaxy formation.** Sato, Humitaka. (Kyoto Univ., Japan. Research Inst. for Fundamental Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Two different approaches to galaxy formation are contrasted: One is the primordial scenario based on particle physics and the another is the pregalactic scenario from astronomical side.

30775 **(KEK—84-12, pp 287-302) Galaxy formation theory and large scale structure in the universe.** Ikeuchi, S. (Hokkaido Univ., Sapporo, Japan. Dept. of Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Two scenarios of galaxy formation are presented: one is the galaxy formation triggered by explosions of pregalactic objects, and the other is the growth of voids and surrounding ridges in a neutrino dominated universe. These scenarios are discussed in relation to the formation of large scale structure in the universe. Some related problems on intergalactic medium are discussed briefly.

30776 **(KEK—84-12, pp 131-147) Infrared observation of the early universe.** Matsumoto, T. (Nagoya Univ., Japan. Faculty of Science). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

The rocket observation of the near-infrared extragalactic background radiation and its influence on the cosmology are described. The future plans to observe the near-infrared and far-infrared backgrounds are also presented.

30777 (KEK—84-12, pp 303-348) **Inflationary universe model.** Sato, Katsuhiko. (Tokyo Univ., Japan. Dept. of Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Recent studies of the inflationary universe model are reviewed. In para. 1 essential ideas and the merits are introduced. In para. 2 details of the original inflationary model and its difficulties are shown. In para. 3 the new inflationary model, which Linde and Albrecht et al proposed in order to avoid the difficulties of the original inflationary model, and the new versions are reviewed. The final section para. 4 is devoted to remarks.

30778 (KEK—84-12, pp 349-358) **Problems in the perturbation analysis of a universe dominated by a coherent scalar field.** Sasaki, Misao. (Kyoto Univ., Japan. Dept. of Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

The temporal bahavior of density fluctuations in a universe dominated by a coherent scalar field is investigated. Our analysis strongly indicates that the coherent nature of the scalar field restrains the growth of density inhomogeneities. This raises a serious problem against a cosmological model which is dominated by a coherent scalar field such as the invisible axion.

30779 (KEK—84-12, pp 359-375) **Comments on the chaotic inflation.** Kodama, Hideo. (Tokyo Univ., Japan. Dept. of Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Some aspects of the chaotic inflation scenario proposed by Linde are discussed. Especially the two problems, whether sufficient reheating of the universe occurs and whether the large scale inhomogenieties produced by quantum fluctuation of the inflation field are small enough, are studied in detail. It is shown that rather strong constraints on the model parameters should be satisfied in order that the chaotic inflation scenario is a viable one.

30780 (KEK—84-12, pp 169-176) **Some topics in cosmic rays.** Arafune, Jiro. (Tokyo Univ., Tanashi, Japan. Inst. for Cosmic Ray Research). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Some topics of cosmic ray physics are introduced, namely, antiproton flux, cosmic ray flux at knee, and 10^{20}eV cosmic rays. Brief introduction of elementary knowledge of cosmic rays are also given, which is closely related to the above topics.

30781 (KEK—84-12, pp 177-200) **Observation of ultra high energy cosmic rays($>=10^{10}$GeV).** Nagano, M. (Tokyo Univ., Tanashi, Japan. Inst. for Cosmic Ray Research). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Recent measurements of energy spectrum, arrival directions and mass compositions of ultra high energy cosmic rays($>=10^{10}$ GeV) are summarized. The surface air shower array of area over 20 km^2 under construction in Akeno and a future plan for a huge array of over 250 km^2 are described.

30782 (KEK—84-12, pp 38-60) **Astrophysical constraints on the monopole abundance.** Fukugita, M. (Kyoto Univ., Japan. Research Inst. for Fundamental Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Astrophysical constraints on the monopole abundance are surveyed. Various constraints derived from the monopole catalysed proton decay are discussed in more detail.

30783 (LBL—21126) **Structure in the universe from massive neutrinos.** Klinkhamer, F.R. (Lawrence Berkeley Lab., CA (USA)). Jan 1986. Contract AC03-76SF00098. 20p. (CONF-860167—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009926.

From Recontres de Moriond workshop on massive neutrinos in particle physics and astrophysics; Tignes, Savoie, France (25 Jan 1986).

A neutrino with hypothetical mass of order 10 eV may have an important role in the formation of large-scale structure in the universe. 23 refs., 8 figs.

30784 (N—86-17239) **Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions.** Lester, D.F.; Dinerstein, H.L.; Werner, M.W.; Harvey, P.M.; Evans, N.J.,II; Brown, R.L. (National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center). Dec 1985. 40p. NTIS, PC A03/MF A01.

Far-infrared and radio continuum maps have been made of the central 6' of the inner-galaxy H II regions G30.8-0.0 (in the W43 complex) and G25.4-02., along with radio and molecular line measurements at selected positions. An effort is made to understand far infrared wavelingths allow the dust temperature structures and total far infrared fluxes to be determined. Comparison of the radio and infrared maps shows a close relationship between the ionized gas and the infrared-emitting material. There is evidence that parts of G30.8 are substantially affected by extinction, even at far-infrared wavelengths. For G25.4-0.2, the radio recombination line and CO line data permit resolution of the distance ambiguity for this source. The confusion in distance determination is found to result from an extraordinary near-superposition of two bright H II regions. Using revised distances of 4.3 kpc for G26.4SE and 12 kpc for G25.4NW, that the latter, which is apparently the fainter of the two sources, is actually the more luminous. Though it is not seen on the Palomar Sky Survey, G25.4SE is easily visible in the 9532A line of S III and is mapped in this line. The ratio of total luminosity to ionizing luminosity is very similar to that of H II regions in the solar circle. Assuming a coeval population of ionizing stars, a normal initial mass function is indicated.

30785 (N—86-17240) **Hydrodynamic models for novae with ejecta rich in oxygen, neon and magnesium.** Starrfield, S.; Sparks, W.M.; Truran, J.W. (Los Alamos National Lab., NM (USA)). 1985. 14p. (NASA-CR—176475). NTIS, PC A02/MF A01.

The characteristics of a new class of novae are identified and explained. This class consists of those objects that have been observed to eject material rich in oxygen, neon, magnesium, and aluminum at high velocities. We propose that for this class of novae the outburst is occurring not on a carbon-oxygen white dwarf but on an oxygen-neon-magnesium white dwarf which has evolved from a star which had a main sequence mass of approx. 8 solar masses to approx. 12 solar masses. An outburst was simulated by evolving 1.25 solar mass white dwarfs accreting hydrogen rich material at various rates. The effective enrichment of the envelope by ONeMg material from the core is simulated by enhancing oxygen in the accreted layers. The resulting evolutionary sequences can eject the entire accreted envelope plus core material at high velocities. They can also become super-Eddington at maximum bolometric luminosity. The expected frequency of such events (approx. 1/4) is in good agreement with the observed numbers of these novae.

30786 (N—86-17255) **Heavy ion compositional signature in ^{3}He-rich solar particle events.** Mason, G.M.; Reames, D.V.; Klecker, B.; Hovestadt, D.; Vonrosenvinge, T.T. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Oct 1985. 53p. NTIS, PC A04/MF A01.

A survey of the approx. 1 MeV/nucleon heavy ion abundances in 66 He^3-rich solar particle events was performed using the Max-Planck-Institut/University of Maryland and Goddard Space Flight Center instruments on the ISEE-3 spacecraft. The observations were carried out in interplanetary space over the period 1978 October through 1982 June. Earlier observations were confirmed which show an enrichment of heavy ions in HE3-rich events, rela-

tive to the average solar energetic particle composition in large particle events. For the survey near 1.5 MeV/nucleon the enrichments compared to large solar particle events are approximately He4:C:O:Ne:Mg:Si:Fe = 0.44:0.66:1.:3.4:3.5:4.1:9.6. Surprising new results emerging from the present broad survey are that the heavy ion enrichment pattern is the same within a factor of approx. 2 for almost all cases, and the degree of heavy ion enrichment is uncorrelated with the He^3 enrichment. Overall, the features established appear to be best explained by an acceleration mechanism in which the He^3 enrichment process is not responsible for the heavy ion enrichment, but rather the heavy ion enrichment is a measure of the ambient coronal composition at the sites where the He^3-rich events occur.

30787 (NASA-CP—2376-VOL-1, pp vp) **Soft-spectrum gamma-ray bursts.** Laros, J.G.; Fenimore, E.E.; Fikani, M.M.; Klebesadel, R.W.; Kane, S.R. (California Univ., Berkeley). Aug 1985. NTIS, PC A18/MF A01.

In Ninteenth International Cosmic Ray Conference. OG seasions, volume 1.

A typical gamma ray burst (GRB), when observed over the approximately 30 keV to 1 MeV range, has a 1 to 10 s duration and a spectrum describable in terms of a several-hundred-keV exponential function. However, KONUS data indicate that some GRBs may belong to a separate class of short (approximately 0.1 s), soft (kT 50 keV) events. This result has been questioned because the KONUS experiments, with only 4 s spectral time resolution and a lack of information approximately 30 keV, are not particularly well suited for the detection and study of these bursts. The UC Berkely/Los Alamos Solar X-Ray Spectrometer/GRB experiment on the International Cometry Explorer (ICE), with nearly continuous coverage of approxiomately one-sixth of the sky down to 5 keV at 0.5 s resolution, is better designed for such a task. Using ICE data, it was confirmed that soft-spectrum events do indeed exist, apparently with properties that set them apart from the general GRB population. Results from the ICE experiment are presented.

30788 (RAL—85-083) **Excitation of the iron Kα feature in solar flares.** Emslie, A.G.; Phillips, K.J.H.; Dennis, B.R. (Rutherford Appleton Lab., Chilton (UK); National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Sep 1985. 28p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701770.

The paper concerns two solar flare events observed with the Hard X-ray Burst Spectrometer and the Kα channel of the X-ray Polychromator Bent Crystal Sepctrometer on the solar Maximum Mission Satellite. The observed magnitude of the Kα enhancement above the fluorescent background at the time of the large X-ray bursts is compared with the predicted Kα flux. The results support a thick-target non-thermal interpretation of impulsive hard X-ray emission in solar flares.

30789 (RAL—85-084) **X-ray signature of solar coronal mass ejections.** Harrison, R.A.; Simnett, G.M.; Waggett, P.W.; Bentley, R.D.; Phillips, K.J.H.; Bruner, M.; Dryer, M. (Rutherford Appleton Lab., Chilton (UK); Lockheed Palo Alto Research Labs., CA (USA); National Oceanic and Atmospheric Administration, Boulder, CO (USA). Space Environment Lab.). Sep 1985. 25p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701771.

The coronal response to six solar X-ray flares has been investigated. At a time coincident with the projected onset of the white-light coronal mass ejection associated with each flare, there is a small discrete soft X-ray enhancement or soft X-ray precursors. Motions of hot X-ray emitting plasma are identified during the precursors, which may well be a signature of the mass ejection onsets. Further investigations have also revealed a second class of X-ray coronal transient, during the main phase of the flare. These appear to be associated with magnetic reconnection above post-flare loop systems.

30790 (RAL—85-086) **Extragalactic Infrared Astronomy.** Gondhalekar, P.M. (Rutherford Appleton Lab., Chilton (UK)). May 1985. 181p. (CONF-8505251—). NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774.

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper concerns the field of Extragalactic Infrared Astronomy, discussed at the Fourth RAL Workshop on Astronomy and Astrophysics. Fifteen papers were presented on infrared emission from extragalactic objects. Both ground-(and aircraft-) based and IRAS infrared data were reviewed. The topics covered star formation in galaxies, active galactic nuclei and cosmology.

30791 (RAL—85-086, pp 1-12) **On the origin of extragalactic infrared radiation.** Yorke, H.W.; Kollatschny, W. (University Observatory Goettingen, Germany, F.R.). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper concerns the infrared radiation flux of galaxies in terms of star formation processes and stellar evolution. Phase transitions in the interstellar medium are discussed, as well as stellar evolution and the time dependent appearance of a galaxy.

30792 (RAL—85-086, pp 13-20) **Starbursts in non-interacting galaxies.** Hawarden, T.G.; Mountain, C.M.; Wade, R.; Joseph, R.D.; Leggett, S.K. (Royal Observatory, Edinburgh, UK; Imperial Coll. of Science and Technology, London, UK. Blackett Lab.; Edinburgh Univ., UK. Dept. of Astronomy). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

Examination of IRAS results for a complete sample of nearby galaxies with $O <= T <= 6$ suggest that, in the absence of strong interactions, IR-luminous starbursts occur only in barred galaxies. This postulate, combined with variations in the supply of gas to the bar, can explain most of the observed IR properties of spirals. Some consequences of these suggestions are discussed.

30793 (RAL—85-086, pp 21-31) **Near infrared imaging of galaxies.** Stewart, J.M. (Royal Observatory, Edinburgh, UK). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper presents images of spiral galaxies in the near infrared. A discussion of the colour distribution of the images includes: the origin of colour variations, extinction properties of extragalactic dust, and distribution of interstellar medium. The results are compared with CO observations.

30794 (RAL—85-086, pp 32-51) **Infrared photometric properties of the average galaxy.** Fairclough, J.H. (Rutherford Appleton Lab., Chilton, UK). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper examines galaxies described in the Revised Shapley Ames catalogue and the IRAS Point Source Catalogue, to allow the criteria of the normal (and abnormal) infrared behaviour of a galaxy to be defined. Samples of the galaxies considered, and derived optical properties of these galaxies are described. Hubble type distributions; far infrared luminosities; far infrared colours; and optical-infrared properties; are all discussed.

30795 (RAL—85-086, pp 60-67) **Near infrared study of Virgo dwarf ellipticals.** Zinnecker, H.; Cannon, R.D. (Royal Observatory, Edinburgh, UK). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

A study is presented of dwarf elliptical galaxies in the Virgo Cluster, using an infrared telescope. JHK photometry of a sample of 11 dwarf ellipticals (d.e.) is reported, together with 5 giant ellipticals (g.e.). B surface photometry is available for most of the d.e. galaxies. The J-H vs H-K two colour diagrams suggest that the metallicity of the d.e. is intermediate between that of the central regions of g.e. and that of several metal poor globular clusters. Also

the diagrams indicate that the age of some of the d.e. could be as young as 2-5 Gyr.

30796 (RAL—85-086, pp 68-86) **Infrared observations of blue compact galaxies.** Gondhalekar, P.M. (Rutherford Appleton Lab., Chilton, UK). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

Near and far infrared observations of blue compact galaxies have been described. The near infrared colours and the infrared-to-radio energy distributions of these galaxies suggest that in some blue compact galaxies the population of low mass evolved stars is small and these galaxies may be young objects. There is good correlation between far infrared luminosity and colours, neutral hydrogen mass and radio emission of these galaxies. The temperature of dust in these galaxies is bimodal and the temperature of the cool component appears to increase as the galaxies get bluer. In addition, the dust mass of these galaxies is extremely low.

30797 (RAL—85-086, pp 87-102) **Infrared emission and extragalactic starbursts.** Telesco, C.M. (National Aeronautics and Space Administration, Huntsville, AL, USA. George C. Marshall Space Flight Center). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper examines the belief that recent star formation plays a significant role in determining many of the infrared properties of galaxies. Pertinent types of infrared observations and the infrared properties of starbursts are briefly summarized. Recently developed models which describe the evolution of starbursts are also considered.

30798 (RAL—85-086, pp 103-113) **Infrared maps of M81: an example of the IRAS Close Galaxy Programme.** Abolins, J.A. (Rutherford Appleton Lab., Chilton, UK). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The infrared maps from the IRAS pointed-mode Close Galaxy Programme provide an important new data base for the study of nearby galaxies. The aim and scope of the programme are described and, as an example of what potential users of the data can expect, maps of the M81 region are presented and briefly discussed. The data base is scheduled for release at the end of 1985.

30799 (RAL—85-086, pp 114-129) **Infrared emission from active nuclei.** Ward, M. (Cambridge Univ., UK. Inst. of Astronomy). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper reviews some recent ground-based infrared observations from 1 - 20 microns of two major classes of active nuclei: LINERs and Seyfert type 1's. In addition, some IRAS data on an X-ray selected sample of Seyfert 1's are presented. The origin of their near I.R. (1-3.5 micron) and mid-I.R. (10-20 micron) emission, and the characteristic shape of their 0.3 - 100 micron continua are all discussed.

30800 (RAL—85-086, pp 130-147) **Blazars, quasars and starbursts.** Robson, E.I. (Preston Polytechnic, UK. Div. of Physics and Astronomy). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper concentrates chiefly on the submillimetre observations of extragalactic objects, obtained (mainly) by the Preston/QMC/Oregon consortium. The spectral observations of blazars, quasars and starbursts are presented and discussed.

30801 (RAL—85-086, pp 148-158) **Infrared search for primeval galaxies.** Collins, C.A.; Joseph, R.D. (Imperial Coll. of Science and Technology, London, UK. Blackett Lab.). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper is concerned with searches for IR objects which may well be primeval galaxies. Expected parameters of a primeval galaxy; limits of previous searches; near IR search programme; and results (3 candidate objects were uncovered); are all discussed.

30802 (RAL—85-086, pp 159-170) **Sunyaev-Zeldovich effect at 1.15 mm wavelength.** Chase, S.T.; Joseph, R.D.; Robertson, N.A.; Ade, P.A.R. (Imperial Coll. of Science and Technology, London, UK. Blackett Lab.; Queen Mary Coll., London, UK. Dept. of Physics). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The Sunyaev-Zeldovich (S-Z) effect is a spectral distortion of the Cosmic Background Radiation, induced by inverse Compton scattering of the microwave photons by energetic electrons in hot astrophysical plasmas. The paper reports the first attempt to detect the S-Z effect at 1.15 mm wavelength, using bolometric detection techniques. A marginal detection of the effect in the distant cluster 0016+16 was found, but not in the cluster A478.

30803 (RAL—85-086, pp 171-173) **Models for IRAS galaxies.** Rowan-Robinson, M.; Crawford, J. (Queen Mary Coll., London, UK. Theoretical Astronomy Unit). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The authors have modelled IRAS 12-100μ observations of galaxies as a mixture of 3 components: a cool "disc" component, a warmer "starburst" component and a "Seyfert" component peaking at 25μ.

30804 (RAL—85-086, pp 174-181) **Cosmological results from IRAS.** Rowan-Robinson, M. (Queen Mary Coll., London, UK. Theoretical Astronomy Unit). May 1985. NTIS (US Sales Only), PC A09/MF A01. File Number DE86701774. (CONF-8505251—).

From 4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics; Abingdon, UK (20 May 1985).

The paper describes how the IRAS survey data can be used to obtain some powerful cosmological results. Source counts in the polar caps; mapping the "local" gravitational field with IRAS; and far infrared cosmological background; are all discussed.

30805 (RRK—84-24) **On a quantized scalar field in the combined de Sitter-Nariai universe.** Nariai, Hidekazu. (Hiroshima Univ., Takehara (Japan). Research Inst. for Theoretical Physics). Sep 1984. 13p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701778.

As a sequel to the previous paper on quantizing a massive or massless scalar field in the de Sitter and Nariai universes, the scalar field in the combined de Sitter-Nariai universe (with a 6-dimensional metric) is canonically quantized. Various bi-scalar propagators are derived and, especially in the massless case, their structures are examined in comparison with those in the de Sitter universe.

30806 (UWThPh—85-19) **Stability of matter.** Thirring, W. (Vienna Univ. (Austria). Inst. fuer Theoretische Physik). 1985. 20p. (In German). NTIS (US Sales Only), PC A02/MF A01. File Number DE86701772.

Basing on quantum mechanics and the simple Hamiltonian consisting of kinetic energy and Coulomb potential, heuristic arguments and estimates are used to guess the essential stability properties of many-particle systems. In view of applications in astrophysics, gravitation as a second potential and thermodynamic arguments are added. The guesses thus obtained are confronted with known

exact results. The connection between the stabilities against explosion and against implosion, and thermodynamic stability is considered. In systems with a particle number larger than approx= 10^{54} (corresponding to the Jupiter mass) gravitational energy prevails over the electrostatic energy and determines the history of a star. Negative specific heat accompanies life and death of a star. Finally the role of stability and instability in the universe for life is outlined.

30807 **(UWThPh—85-27) Spin-3/2 fields on black hole spacetimes.** Aichelburg, P.C. (Vienna Univ. (Austria). Inst. fuer Theoretische Physik). 1985. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701773.

Results obtained for spin-3/2 perturbations on stationary black hole space-time are briefly summarized.

6402 Atmospheric Physics

REFER ALSO TO CITATION(S) 30975

30808 **(DOE/NV/10282—5013) BUARO PSD vs height.** Lebeda, C.; Pongratz, M. (EG and G, Inc., Los Alamos, NM (USA). Los Alamos Operations). Sep 1985. Contract AC08-83NV10282. 64p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009847.

BUARO is the code name of the shaped-charge, barium plasma injection experiment launched June 7, 1976, from the DOE's Hawaiian test facility at Kauai (22.06°N, 200.21°E). The experiment investigated plasma instabilities and striation phenomena first observed in a similar experiment, code-named LOXIA, conducted May 14, 1975. The BUARO rocket payload contained seven shaped charges. An attitude control system aligned the injection perpendicular to the geomagnetic field. Ground stations located at the DOE observatories atop Mt. Haleakala on Maui photographed optical emissions. The technical objectives were both scientific and engineering in nature: (1) to investigate the wave-particle plasma interactions from injection of a dense barium plasma perpendicular to the geomagnetic field; (2) investigate electron heating and the subsequent ambient excitations from such an injection; (3) investigate plasma striation mechanisms concurrently in both collisional and collisionless environments; and (4) evaluate the engineering design and performance of the sevenfold larger shaped-charge payload. 9 refs., 54 figs., 5 tabs.

30809 **(LA-UR—86-1011) Hostile energetic particle radiation environments in earth's outer magnetosphere.** Baker, D.N.; Belian, R.D.; Higbie, P.R.; Klebesadel, R.W.; Blake, J.B. (Los Alamos National Lab., NM (USA); Aerospace Corp., El Segundo, CA (USA). Space Sciences Lab.). 1986. Contract W-7405-ENG-36. 15p. (CONF-8606108—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86008752.

From AGARD symposium; Hague, Netherlands (2 Jun 1986).

Many spacecraft operational problems in Earth's outer magnetosphere appear to be due to intense, transient radiation phenomena. Three types of naturally-occurring, and highly variable, hostile particle radiation environments are encountered at, or near, the geostationary orbit: (1) High-energy protons due to solar flares; (2) Energetic ions and electrons produced by magnetospheric substorms; and (3) very high energy electrons of uncertain origin. Present particle sensor systems provide energetic particle detection and assessment capabilities during these kinds of high-energy radiation events. In this paper, particular emphasis is given to highly relativistic electrons (3 ~ 10 MeV). Electron fluxes and energy spectra are shown which were measured by two high-energy electron sensor systems at 6.6 R/sub E/ from 1979 through 1984. Large, persistent increases in this population were found to be relatively infrequent and sporadic in 1979-81 around solar maximum. During the approach to solar minimum (1981 to present) it is observed that the highly relativistic electrons occur with a regular 27-day periodicity, and are well associated with the re-established solar wind stream structures. Through a superposed epoch analysis technique we show that an energetic electron enhancement typically rises on a 2- to 3-day time scale and decays on 3- to 4-day time scale at essentially all energies above ~3 MeV. The present analysis suggests that the Jovian magnetosphere is a recurrent source of this significant electron population in the outer terrestrial magnetosphere and that these electrons have a very deleterious influence on spacecraft systems due to deep dielectric charging and low-dose susceptibility effects. 13 refs., 11 figs.

30810 **(UCRL—93549) Constructing a coherent long-term global total ozone climatology from the BUV, MFR, and SBUV/TOMS data sets.** Ellis, J.S.; Luther, F.M. (Lawrence Livermore National Lab., CA (USA)). Feb 1986. Contract W-7405-ENG-48. 11p. (CONF-8605102—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009722.

From 2. conference on satellite meteorology: remote sensing and applications; Williamsburg, PA, USA (12 May 1986).

The backscatter ultraviolet spectrometer (BUV) aboard the NIMBUS 4 satellite provided global ozone data until mid-1977. The Total Ozone Mapping Spectrometer (TOMS) and Solar Backscattered Ultraviolet (SBUV) instrument aboard the NIMBUS 7 satellite began providing global ozone in November 1978. The only satellite derived global total ozone data available between the termination of the BUV data and the startup of the SBUV/TOMS data is that from the Multichannel Filter Radiometer (MFR) instrument aboard the Defense Meteorological Satellite Program (DMSP) series of satellites. The MFR and the SBUV/TOMS data are compared during the data overlap period in order to determine how well the MFR data might be used to represent the SBUV/TOMS and BUV data during the data gap period. 5 refs., 3 figs., 3 tabs.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 30364, 30968, 30977

30811 **(CONF-860622—1) Resonantly enhanced third-harmonic generation and multiphoton ionization in cesium vapor.** Hamadani, S.M.; Stockdale, J.A.D.; Compton, R.N. (Laseronics, Inc., Los Angeles, CA (USA); Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86005384.

From OSA/IEEE conference on lasers and electro-optics (CLEO '86); San Francisco, CA, USA (9 Jun 1986).

Simultaneous third-harmonic generation and multiphoton ionization are investigated in cesium. Very large infrared to blue conversion efficiencies (~1%) are observed near the two-photon allowed 6D states and three-photon allowed 7P states. 1 ref., 3 figs.

30812 **(DOE/ER/13394—1) Studies of autoionizing states relevant to dielectronic recombination. Progress report, July 1, 1985-June 30, 1986.** Gallagher, T.F. (Virginia Univ., Charlottesville (USA). Dept. of Physics). 18 Apr 1986. Contract FG05-85ER13394. 18p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010285.

In CTR plasmas a major power loss is radiation from partially stripped impurity ions, and it increases with the reduction in the degree of ionization. Thus recombination processes are important, and for multielectron atoms, dielectronic recombination, which proceeds via autoionizing states, is particularly important. Unfortunately, we do not have complete confidence in our understanding of this process due to the lack of fundamental atomic data on highly excited autoionizing states. Here we outline the progress in a program to investigate the properties of autoioinizing states of alkaline earth atoms (mostly in Sr) by means of a multistep laser excitation technique. This approach allows us to study autoionizing states of arbitrary n and l in a controlled environment. Specifically, we are measuring autoionization rates of autoionizing states of alkaline earth atoms, and the energy and angular distributions of ejected electrons. These experiements will yield the basic atomic data required to make accurate calculations of dielectronic recombination rates. 19 refs., 4 figs.

30813 **(DOE/ER/13456—1) Production and destruction of metastable negative ions. Progress report, September 1, 1985-August 31, 1986.** Pegg, D.J. (Tennessee Univ., Knoxville (USA). Dept. of Physics). 1986. Contract FG05-85ER13456. 10p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010284.

We have continued to investigate the structure of metastable negative ions using fast-beam autodetachment spectroscopy. The rather surprising discovery that the metastable negative ion dimer He_2^- could be produced in our apparatus caused us to concentrate for most of the grant period on determining its structure. This work led us, in turn, to make further survey measurements to see if we could produce and study the structure of other exotic metastable molecular negative ions such as OH^-, H_2O^-, NH_2^-, and NeH^- which are difficult to produce by other means. We failed to detect any production of H_2O^- or HeH^- ions but we did detect small amounts of OH^- and NH_2^- ions. Spectroscopic measurements on these low intensity beams did not produce any detectable discrete energy features. This result could mean that the ions are formed in stable states or, if they are metastable, the signal-to-noise ratio in our measurements was insufficient to exhibit structure in the spectra.

30814 **(LBL—21260) Proton and deuterium NMR experiments in zero field.** Millar, J.M. (Lawrence Berkeley Lab., CA (USA)). Feb 1986. Contract AC03-76SF00098. 291p. NTIS, PC A13/MF A01; 1; GPO Dep. File Number DE86009952.

High field solid-state NMR lineshapes suffer from inhomogeneous broadening since resonance frequencies are a function of molecular orientation. Time domain zero field NMR is a two-dimensional field-cycling technique which removes this broadening by probing the evolution of the spin system under zero applied field. The simplest version, the sudden transition experiment, induces zero field evolution by the sudden removal of the applied magnetic field. Theory and experimental results of this experiment and several variations using pulsed dc magnetic fuelds to initiate zero field evolution are presented. In particular, the pulsed indirect detection method allows detection of the zero field spectrum of one nuclear spin species via another (usually protons) by utilizing the level crossings which occur upon adiabatic demagnetization to zero field. Experimental examples of proton/deuteron systems are presented which demonstrate the method results in enhanced sensitivity relative to that obtained in sudden transition experiments performed directly on deuterium. High resolution ^3H NQR spectra of a series of benzoic acid derivatives are obtained using the sudden transition and indirect detection methods. Librational oscillations in the water molecules of barium chlorate monohydrate are studied using proton and deuterium ZF experiments. 177 refs., 88 figs., 2 tabs.

30815 **Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure.** Morris, D.E.; Woodruff, W.H. (Los Alamos National Lab., NM). *Journal of Physical Chemistry;* **89**: No. 26, 5795-5798(19 Dec 1985).

The time-dependent theory of resonance Raman scattering developed by Heller and co-workers is extended to a more general case which considers simultaneous occurrence of excited-state normal-coordinate displacements, force-constant changes, and Duschinsky rotation upon resonant electronic excitation. General expressions are developed for ground-state scattering intensities (fundamentals, overtones, and combinations) in terms of excited-state structural and force-field parameters. It is shown that all factors contributing to the intensities must be considered if accurate excited-state parameters are to be obtained from experimental data. In particular, additional terms which were not explicitly developed in the earlier treatments can dramatically influence the calculated overtone and combination intensities. The results are applied to the redetermination of the displacement of the Mo-Mo coordinate in the δ-δ^* excited state of quadruply bonded $Mo_2(O_2CR)_4$, and compared to an earlier determination which employed a simplified form of the theory. 14 references, 3 figures.

30816 **Exact eigenfunctions and eigenvalues of a two-dimensional rigid rotor obtained using Gaussian wave packet dynamics.** Reimers, J.R.; Heller, E.J. (California Univ., La Jolla; Washington Univ., Seattle). *Journal of Chemical Physics;* **83**: 511-515(Jul 1985).

Exact eigenfunctions for a two-dimensional rigid rotor are obtained using Gaussian wave packet dynamics. The wave functions are obtained by propagating, without approximation, an infinite set of Gaussian wave packets that collectively have the correct periodicity, being coherent states appropriate to this rotational problem. This result leads to a numerical method for the semiclassical calculation of rovibrational, molecular eigenstates. Also, a simple, almost classical, approximation to full wave packet dynamics is shown to give exact results: this leads to an a posteriori justification of the De Leon-Heller spectral quantization method. 27 references.

30817 **Exact thermal rotational spectrum of a two-dimensional rigid rotor obtained using Gaussian wave packet dynamics.** Reimers, J.R.; Heller, E.J. (California Univ., Ja Jolla; Washington Univ., Seattle). *Journal of Chemical Physics;* **83**: 516-520(Jul 1985).

The exact thermal rotational spectrum of a two-dimensional rigid rotor is obtained using Gaussian wave packet dynamics. The spectrum is obtained by propagating, without approximation, infinite sets of Gaussian wave packets. These sets are constructed so that collectively they have the correct periodicity, and indeed, are coherent states appropriate to this problem. Also, simple, almost classical, approximations to full wave packet dynamics are shown to give results which are either exact or very nearly exact. Advantages of the use of Gaussian wave packet dynamics over conventional linear response theory are discussed. 21 references.

30818 **S-wave threshold in electron attachment - observations and cross sections in CCl4 and SF6 at ultralow electron energies.** Chutjian, A.; Alajajian, S.H. (California Institute of Technology, Pasadena). *Physical Review [Section] A: General Physics;* **31**: 2885-2892(May 1985).

The threshold photoionization method was used to study low-energy electron attachment phenomena in and cross sections of CCl4 and SF6 compounds, which have applications in the design of gaseous dielectrics and diffuse discharge opening switches. Measurements were made at electron energies from below threshold to 140 meV at resolutions of 6 and 8 meV. A narrow resolution-limited structure was observed in electron attachment to CCl4 and SF6 at electron energies below 10 meV, which is attributed to the divergence of the attachment cross section in the limit epsilon, 1 approaches zero. The results are compared with experimental collisional-ionization results, electron-swarm unfolded cross sections, and earlier threshold photoionization data. 34 refs.

30819 **Reactive and inelastic energy transfer in $H+D_2$ collisions studied by single-collision CARS spectroscopy.** Valentini, J.J.; Gerrity, D.P. New York, NY; American Institute of Chemical Engineers (1985). 11p. (CONF-841121—). American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017.

From AIChE annual meeting; San Francisco, CA, USA (25 Nov 1984).

Highly time-resolved ($\simeq$5ns) coherent anti-Stokes Raman scattering (CARS) spectroscopy obtains product Raman spectra after single collisions with D_2 of laser-photolytically-generated hydrogen atoms. Varying photolysis wavelength changes H-atom energies. HD and D_2 Raman spectra yield product quantum-state distributions, elucidating dynamics of reactive and inelastic energy transfer.

6404 Fluid Physics

30820 **(IC—85/38) Roton-like excitation in superfluid helium-4.** Ahmad, M.; Tikoo, S.K. (International Centre for Theoretical Physics, Trieste (Italy); Kashmir Univ., Srinagar (India). Dept. of Physics). May 1985. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701779.

A second quantized technique is used to study the thermodynamic behaviour of roton-like excitations, in liquid helium-4. Temperature dependence and density dependence of the energy-gap needed for roton-like excitations are obtained from this model.

30821 (UCD—472-130, pp 106-115) **Slip correction measurements for aerosol particles of doublet and triangular triplet aggregates of spheres.** Allen, M.D.; Raabe, O.G. Nov 1985. NTIS, PC A07/MF A01. File Number DE86006840.

In [Radiobiology research.] Annual report, fiscal year 1984.

Slip correction measurements were made on six doublets and six triangular triplet aggregates of uniform plastic spheres in an improved Millikan apparatus. The results were compared with theoretical methods for correcting aggregates of uniform spheres for slip. Each calculated value of the slip correction factor, C(D/sub s/), was used to solve for the adjusted sphere factor (psi) in the Knudsen-Weber form of the slip correction equation where D/sub s/ = psiD[1] and D[1] is the sphere diameter. For doublets (n/sub p/ = 2) of 1.18-μm polystyrene latex spheres in parallel motion, the average value of psi was computed to be 1.384. For triangular triplets (n/sub p/ = 3) in parallel motion, the average value of psi was computed to be 1.453. Values of psi that were computed from the reported measurements of other investigators showed fair agreement with our results.

6450 High Energy Physics

30822 **(KEK—83-12) Proceedings of the workshop on 'monopoles and proton decay'.** Arafune, J.; Sugawara, H. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Jul 1983. 98p. (CONF-8210345—). NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434.

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

Individual papers in this workshop proceedings are separately abstracted.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 30873

30823 **(DOE/ER/10690—6) Participation in the ARGUS experiment at the DORIS collider at DESY, Hamburg, Germany.** Darden, C. (South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy). 27 Mar 1986. Contract AS09-80ER10690. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009517.

Progress reported for 1985 includes publishing final results for investigation of F mesons. Particle decays were sought including a gamma line at 9.46 GeV. One such decay was Upsilon(1S)→γH°. A search for fractionally charged particles is reported. The muon pair branching ratio was determined for decays of the Upsilon(2S). Six anti-deuterons were seen in a data sample of over 720,000 electron-positron annihilation events. A clear D° signal was seen in the K^+K^- channel. Results were obtained for the radiative transitions from the Upsilon(2S) to the 1^3P states of the banti-b system. Fifteen events were also seen which were interpreted to be the color suppressed decay of a B meson to J/psi. A new upper limit was set for the mass of the tau neutrino. A CAMAC booster was used to reduce dead time in the experiment. New preamplifiers raised the vertex drift chambers enough above the electromagnetic noise of the storage ring that it was no longer a problem. The performance of the inner compensation coils, storage ring, and main drift chamber are reported, as well as the time of flight, shower, and muon counters. (LEW)

30824 **(DOE/ER/40085—10) K-meson production by nu/sub μ/-deuterium reactions near threshold: implications for nucleon-decay searches.** Mann, W.A.; Kafka, T.; Derrick, M.; Musgrave, B.; Ammar, R.; Day, D.; Gress, J. (Tufts Univ., Medford, MA (USA); Argonne National Lab., IL (USA); Kansas Univ., Lawrence (USA)). 1986. Contract AC02-83ER40085. 30p. (ANL-HEP-PR—86-04). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009946.

The extent to which atmospheric neutrino interactions can mimic nucleon decay into modes with a strange particle in the final state is evaluated using nu/sub μ/-deuterium interactions recorded by the 12-Foot Bubble Chamber at the ANL Zero Gradient Synchrotron. Event distributions representative of atmospheric neutrinos with 1 < E/sub nu/ < 5 GeV are studied. Such neutrino interactions in massive underground detectors will yield K° and K^+ mesons with respective rates of 1.5 +- 0.8 and 4.2 +- 2.3 per kiloton year. However, the neutrino-induced events have final-state invariant mass and net momentum which are distinctly different from the values that characterize nucleon decay. Consequently, at lifetime levels corresponding to ten kilton years of detector exposure, experimental searches capable of reconstructing these variables will not encounter substantial neutrino background for nucleon decay modes leading to K mesons in the final state. 24 refs, 4 figs.

30825 **(INIS-mf—10040) Inclusive production of strange particles in 360 GeV/c PP interactions.** Rodrigo Anoro, T. (Universidad Autonoma de Madrid (Spain). Facultad de Ciencias Fisicas). 1985. 324p. (In Spanish). NTIS (US Sales Only), PC A14/MF A01. File Number DE86701793.

Results on cross sections, longitudinal and transverse momentum distributions for ksub(s)sup(o), Λ and anti Λ production in 360 GeV/c PP interactions are presented as obtained from EHS equipped with the Rapid Cycling Bubble Chamber (RCBC). The Λ and anti Λ polarization are measured. The cross sections for the diffractive components are given using the recoil spectrum. The data are discussed with respect to charm production. The study on inclusive production of strange meson and baryon resonances is presented. Results are given on cross sections for K**(892), K*(892), Σ^+(1385) and Σ(1285). Longitudinal and transverse momentum distributions for K*(892) and Σ(1385) are presented as well as for their induced Ksup(o's) and Λsup('s). An estimation is given on the K*(1430) and Σ*(1915) productions.

30826 (KEK—83-12, pp 171-189) **Electron antineutrino mass from the β-decay of ^{3}H.** Fujioka, M. (Tohoku Univ., Sendai, Japan. Cyclotron and Radioisotope Center). Jul 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434. (CONF-8210345—).

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

Experimental results on the mass of electron antineutrino m anti vsub(e) from the β-decay of ^{3}H are briefly reviewed, and a project is described of obtaining m anti vsub(e) by the same method using the INS (Institute for Nuclear Study, University of Tokyo) iron-free $\pi\sqrt{2}$ β-ray spectrometer. The necessary statistics and the atomic effect on the ^{3}H β-decay are discussed.

30827 (KEK—83-12, pp 135-149) **Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho.** Yasumi, Shinjiro. (National Lab. for High Energy Physics, Oho, Ibaraki, Japan). Jul 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434. (CONF-8210345—).

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

An experiment to determine the electron neutrino mass was done by using electron capture in Ho-163. Since the data on the Q-value and half-life of Ho-163, which are closely relevant to the neutrino mass measurement, were contradictory, attempt was made to estimate these two quantities from the intensity of M X-ray from Ho-163 and the total number of Ho-163 in the source. The Ho-163 nuclei were produced through the (p, 2n) reaction on Dy-164 by using an AVF cyclotron. The contaminant radioisotopes were completely removed by elaborate chemical separation processes. The total number of Ho-163 atoms was determined by using the PIXE method. The M-capture half-life of Ho-163 was determined from the M X-ray intensity, and was (4.5 +- 1.5) x 10^4y. This was in good agreement with CERN's value. By using this value, a useful relation between the Q-value of Ho-163 and the mass of the electron neutrino can be deduced. An upper limit of the mass of the electron neutrino was obtained as 1.25 keV from the Q-value measured by the CERN group.

30828 (KEK—83-12, pp 150-170) **Neutrino oscillation.** Nagashima, Y. (Osaka Univ., Japan). Jul 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434. (CONF-8210345—).

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

The neutrino oscillation by flavor mixing is discussed. The discussion is confined to the case of two neutrinos. Two distinct types of experiments exist. One is the so called appearance type, and the other is the disappearance or survival type. Three different regions of L (the distance which the neutrino travelled) are considered. They are the long wave or low mass limit, the optimum oscillation region and the short wave or large mass limit. At present, although there has been some indication of possible neutrino oscillation, subsequent experimental results at reactors and accelerators have not confirmed them. An experimental project is planned to look for the signature of neutrino capture by neutrons to measure the appearance reaction. The detector consists of liquid scintillators, proportional drift tubes (PDT) followed by a gamma catcher. Several other experiments are in progress in the world, and are summarized in this paper. As long as artificial neutrino beam is used, there is a natural boundary of L. Therefore, it is considered to use natural neutrino sources (for example, cosmic ray).

30829 (KEK—83-12, pp 51-64) **Monopole annihilations and the knee in cosmic ray data.** Rotelli, P. (National Lab. for High Energy Physics, Oho, Ibaraki, Japan). Jul 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434. (CONF-8210345—).

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

The hypothesis is made that the knee in the integrated primary cosmic ray spectrum is due to the nucleon(antinucleon) decay products of monopole-antimonopole annihilations. The rate of such annihilations is calculated and some speculations on the annihilation scenario are presented.

30830 (KEK—83-31, pp 1-13) **Physics with high energy accelerators in the future.** Shimizu, Y. (Tokyo Univ., Japan. Dept. of Physics). Mar 1984. NTIS (US Sales Only), PC A03/MF A01. File Number DE86780435. (CONF-8210346—).

From 1. TRISTAN phase II workshop; Oho, Ibaraki, Japan (12 Oct 1982).

Phenomena expected in the energy region of 10-100 TeV are discussed. The grand unified theory based on SU(5) is used as the standard model for the present discussion. Since no new particles appear in the energy region higher than 0.1 TeV, the only way to test the theory is to measure the magnitude and the variation of the coupling constants with a mass scale. Three of them αsub(S), αsub(L) and αsub(1) correspond to colar SU(3), strength, and SU(2)sub(L) x U(1) electro-weak interactions, respectively. The lowest order renormalization group equations for these are presented. Values of the constants can be evaluated. As the next example for the theory, the model based on the orthogonal group O(14) is considered. The advantage of this group over SU(5) is due to the fact that it predicts four generations in total. Each fermion is accompanied by its conjugate. Then, the model contains (8 x 4) x 2 = 64 fermions in total. The phenomenology of this model was examined. Though only 8 x 3 fermions are known, a very rich particle spectrum is expected. Values of the constants are obtained, and are different from those obtained from SU(5), since the number of fermions is doubled. To construct a model of composite quarks and leptons, it is, in general, needed to assume that the scale parameter is larger than 100 TeV to account for various experimental limits on the rare decays. Discussions on the magnitude of the parameter are presented.

30831 (KEK—83-31) **Proceedings of the first TRISTAN phase II workshop.** Hirabayashi, H.; Shimizu, Y.; Yoshioka, M. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Mar 1984. 39p. (CONF-8210346—). NTIS (US Sales Only), PC A03/MF A01. File Number DE86780435.

From 1. TRISTAN phase II workshop; Oho, Ibaraki, Japan (12 Oct 1982).

Individual papers in these proceedings are abstracted separately. (LEW)

30832 (KEK—84-12, pp 32-37) **Nucleon decay experiment at Kolar Gold Field.** Krishnaswamy, M.R.; Menon, M.G.K.; Mondal, N.K. (Tata Inst. of Fundamental Research, Bombay, India). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

30833 (KEK—84-12, pp 211-239) **Brief review on neutrino mass measurements.** Yasuda, T.; Ohshima, T. (Tokyo Univ., Tanashi, Japan. Inst. for Nuclear Study). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Since 1980, many experiments with new interesting ideas for the measurement of the electron (anti-) neutrino mass have been and are currently proceeding in the world. Their results are eagerly awaited in the field of the elementary particle physics, astrophysics and cosmology to confirm that the neutrino has the mass of a few tens of eV.

30834 (KEK—84-12, pp 240-249) **Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho.** Yasumi, Shinjiro. (National Lab. for High Energy Physics, Oho, Ibaraki, Japan). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

30835 (KEK—84-12, pp 88-94) **Underground searches for anomalous penetrating particles.** Orito, S. (Tokyo Univ., Japan. Dept. of Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

A series of experiments are being performed at Kamioka Mine in search of anomalous cosmic ray particles such as GUT magnetic monopoles, heavy slow charged particles and relativistic fractionally charged leptons. We report on the results from or the status of: 1) Scintillator telescopes of 22 m^{2}Srsup()), 2) Scintillator telescope of 110 m^{2}Srsup(+)), 3) Plastic track detector CR39 of 2500m^2 Srsup(++)), 4) Protype study of a large area He drift chamber.

30836 (LAL—85-09) **Search of prompt electrons in the NA14 photoproduction experiment at the CERN.** de Bouard, G. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Mar 1985. 171p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE86751347.

The purpose of this thesis is to isolate a prompt electron signal from the data of the NA14 photoproduction experiment at CERN. For that aim, a fast data filtering program has been developed. In order to have a good understanding of the electrons behaviour in the electromagnetic calorimeter, electrons from photon conversion were selected. The observation of events with a reconstructed psi and the sharing between the different psi production mechanism leads to a clear excess of the inelastic process relative to a QCD theoretical expectation. The prompt electrons measurement method, when applied to events obtained from a π beam, does not give any evidence for a signal. With incident photons, a strong signal is seen which cannot been explained by the Bethe Heitler mechanism and psi production alone. This signal is stronger than the photon-gluon fusion model prediction.

30837 (LAL—85-27) **DM2 results on hadronic and radiactive J/psi decays.** Augustin, J.E.; Calcaterra, S.; Cosme, G. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Jul 1985. 95p. (CONF-850721—21). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751355.

From International Europhysics conference on high energy physics; Bari, Italy (18 Jul 1985).

The p anti-p and Λ anti-Λ channels and their angular distributions have been studied and a measurement of the α values of the (1 + α cos²theta) parameterization is given. Results on purely hadronic decays J/psi → Vector + Tensor are discussed in different modes: phiπ⁺π where the S*(975) is observed, phiK⁺K and phiKsub(S)Ksub(S) which present clear f'(1525) signal and some evidence of theta(1700) production and ωπ⁺π including ωf and ωX where X is a broad enhancement around 500 MeV. Finally radiative decays have been extensively studied. All neutral final states provide a measurement of J/psi → γπ⁰ and J/psi → γf → γπ⁰π⁰ branching fractions. From the J/psi → γπ⁺π channel, branching ratios and resonance parameters are given for the f(1270), the theta(1700) and a bump observed around 2100 MeV. The f'(1525) and theta(1700) parameters are derived from the analysis of γK⁺K and γKsub(S)Ksub(S) decay modes. Branching ratios are given for J/psi → γiota, the iota being observed in Ksub(S)K⁺π⁺ and K⁺Kπ⁰ modes. The etasub(c) production is also studied in this last mode. A rhoγ signal is seen in the iota mass region. The ωω mass spectrum for γωω events, exhibits a large bump between 1700 and 1900 MeV/c² and a clear etasub(c) signal is present in J/psi → γphiphi. Branching ratios and spin-parity assignments are studied for both states. An analysis of the low-mass phiphi spectrum is also presented. 62 figs.; 23 refs.

30838 (LAL—85-32) New particle searches at e⁺e machines. Haissinski, J. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Sep 1985. 14p. (CONF-8506194—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751357.

From International symposium on multiparticle dynamics; Kiryat Anavim, Israel (9 Jun 1985).

Recent results on new particle searches with e⁺e colliding beam rings are reported. This brief review makes no attempt for comprehensiveness but some emphasis is put on the searches for new heavy leptons and for supersymmetric particles, and on the question of particle compositeness. 37 refs.; 15 figs.

30839 (LAL—85-34) DM2 results on J/psi decays. Jean Marie, B. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Sep 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86751373.

The DM2 experiment has taken data in the energy range 1.3 to 2.3 GeV. The results presented are based on the analysis of the whole data. Only two main aspects of the J/psi physics is treated: purely hadronic decays (p anti-p, Λ anti-Λ, ωππ, PHIKK) and radiative decays (γiota, γf', γtheta). The normalization is done by measuring the decay J/psi → rhoπ and using an averaged branching fraction value of (1.42 +- .2)%. Furthermore the rhoπ events have been used to check the Monte Carlo simulation of the detector.

30840 (LAL—85-37) Selected results on J/psi hadronic decays from DM2 and Mark III. Augustin, J.E. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Sep 1985. 16p. (CONF-850785—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751356.

From 5. international conference on physics in collision; Autun, France (3 Jul 1985).

Results from the high statistics experiments Mark III and DM2 on J/psi hadronic decays are reviewed. Special interest is given to SU3 violating decays into two pseudoscalars and baryon-antibaryon, especially the first observation of J/psi → K⁰sub(S)K⁰sub(L). The complete measurement of the vector + pseudoscalar modes allows a new determination of the eta and eta' mixing parameters, indicating the presence of a new component in the eta' wave function. The iota(1440) and theta(1700) gluonium candidates have been searched for in hadronic decays, and the Mark III experiment observes a signal in J/psi → ω iota (or ωE).

30841 (LPNHEP-T—84-01) High accuracy measurement of the total cross section and of the real part of the scattering amplitude πip from 2 to 14 GeV/c. Lellouch, D. (Paris-6 Univ., 75 (France). Lab. de Physique Nucleaire et de Hautes Energies; Paris-6 Univ., 75 (France)). Nov 1984. 270p. (In French). NTIS (US Sales Only), PC A12/MF A01. File Number DE86751595.

This thesis presents the results of the experiment PS 157 which has been carried out at the CERN in 1980; the total cross section of π⁺p for 4000 values of energy was measured with an accuracy of 5%. The density of the measurements allows the exploration of a new region of the plane (width, elasticity) for narrow baryon resonances of which the mass is between 2 and 5,5 GeV/c². The total cross section of K⁻p has also been measured between 4,6 and 4,9 GeV/c for 80 momentum values; the measurement quality allows to exclude any narrow resonance of which the partial elastic width is below 10 kw/c² and to clarify the confused situation of the Δ resonances. The principles of the measurements are first given. The experimental results of the researches of narrow baryon resonances are presented; the main results of baryonium physics are recalled as also the most important theoretical models which are applied to mesobaryons. Then, one deals with the normalization process, the efficiency of the transmission detectors, and the determination of the total cross section. Finally, the total cross sections of π⁺p and π⁻p are compared, and one studies the forward elastic differential cross sections, to determinate on one side "the slope" of the nuclear differential cross section, and on the other side the real part of the scattering amplitude, by means of the measurement of the interference term between the Coulomb and nuclear amplitudes. 33 refs.

30842 (PCCF-T—84-03) Pion electroproduction at threshold in the inverse channel: πp → ne⁺e. Determination method of the longitudinal multipole Lsub(0+)sup(π) at small transfer. Preparation of the experiment. Fonvieille, H. (Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire; Clermont-Ferrand-2 Univ., 63 - Aubiere (France)). 1984. 145p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751348.

Our main is to give for the first time an experimental value of the longitudinal multipole Lsub(0+)sup(π) (k²) for small transfers in the time-like region (/k²/ < 0.5 fm²) by studying the process: πp → ne⁺e at threshold. The pion beam is stopped in a liquid hydrogen target, and the lepton pair is detected in a double arm high-resolution, large-acceptance spectrometer (magnet + drift chambers). We describe here the preparating phases of the experiment. After a brief review of the theoretical approaches, we discuss the method for selecting the events from the background (due to: πp → nγ, γ → e⁺e, and πp → π⁰n, π⁰ → γe⁺e) and present a method for analyzing our data, from which the multiple Lsub(0+)sup(π) (k²) is to be determined with an average 10% precision. For that purpose, we give an approximate calculation of the experimental resolution. The choice of the experimental set-up and its realization are then described. The experiment (a Clermont-LPC, Saclay-DPhN/HE, Lyon-IPN Collaboration) takes place on the ALS-pion Beam (Saclay). The whole experimental set-up has been recently checked satisfactorily.

30843 (RAL—85-076) Lifetime measurements of hadrons containing heavy quarks at PETRA and PEP. Forden, G.E. (Rutherford Appleton Lab., Chilton (UK)). Oct 1985. 18p. (CONF-850768—6). NTIS (US Sales Only), PC A02/MF A01. File Number DE86701792.

From SLAC summer institute on particle physics; Stanford, CA, USA (23 Jul 1985).

Recent lifetime measurements of heavy particles at PETRA and PEP are reviewed. A comparison of the methods used is given. The world averages for the lifetimes of the D⁰ and D⁺ mesons are found to be (tausub(D⁰))=3.97 +- 0.3 x 10⁻¹³ sec and (tausub(D+-))=8.0 +- 0.6 x 10⁻¹³ sec. This difference in lifetimes is discussed in light of recent information about exclusive decays. The world average for the lifetime of bottom hadrons is determined to be (tausub(b))=11.0 +- 1.5 x 10⁻¹³ sec and new estimates for the b quark mixing elements, chemical bondVsub(bu)chemical bond and chemical bondVsub(bc)chemical bond, are given.

30844 (RAL—85-091) Constant scattering length fits to low energy Kp interactions. Conboy, J.E. (Rutherford Appleton Lab., Chilton (UK)). Oct 1985. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701794.

The paper concerns the data on low energy Kp interactions analysed using the constant scattering length (C.S.L.) approximation. The scattering lengths are found to differ significantly from those required to fit data from previous K^1p experiments, and these differences are discussed. The data indicate an Tspin=1 P- wave interaction, from the production angle distributions of the K-bar°n, $\Sigma^+ \pi^+$ and $\Lambda\pi^0$ channels. However the authors have been unable to fit both the P-wave and K°sub(L)p data with the simple C.S.L. model.

30845 (SLAC-PUB—3845) Gluonium candidates from hadronic and e^+e^- interactions. Heusch, C.A. (California Univ., Santa Cruz (USA). Inst. for Particle Physics; Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Dec 1985. Contract AC03-76SF00515. 32p. (CONF-8503146—5; SCIPP—85/48). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009782.

From Topical seminar on few and many quark systems; San Miniato, Italy (25 Mar 1985).

The experimental approaches exploited in the search for gluonia that are deemed most promising are briefly described, both in hadron-hadron collisions and heavy quarkonium decay. The presently available evidence is summarized for those states that have been claimed as possible gluonia. Proceeding in the order of lowest-mass expectation, categorization is done only in terms of definitive (or putative) J/sup PC/ assignments. 51 refs., 16 figs., 3 tabs. (LEW)

30846 (SLAC-PUB—3904) ASP: a search for single photon events at PEP. Hollebeek, R. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Mar 1986. Contract AC03-76SF00515. 12p. (CONF-8505229—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009199.

From New particles conference; Madison, WI, USA (8 May 1985).

The ASP search for events with a single photon and no other observed particles is reviewed. New results on the number of neutrino generations and limits on selectron, photino, squark and gluino masses are presented.

30847 How to search for new particles at anti pp colliders. Barger, V. (Physics Dept., Univ. of Wisconsin, Madison, WI 53706). pp 375-394 of Antiproton 1984. Accord, MA; Adam Hilger Ltd. (1985). (CONF-840795—). Contract AC02-76ER00881.

From 7. European symposium on antiproton interactions; Durham, UK (9 Jul 1984).

Methods for identifying the T quark, a fourth generation of quarks and leptons, supersymmetrict partners of the known particles, and the Higgs boson at anti pp colliders are discussed. The properties of events with single leptons, multileptons, and missing P/sub t/ along with hadronic jets are studied. The techniques include lepton isolation, jet broadness, Jacobian Peaks, transverse masses and azimuthal correlations.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 30782, 30883

30848 (ANL-HEP-CP—86-19) Diffractive hard scattering and the SSC. Berger, E.L.; Collins, J.C.; Soper, D.E.; Sterman, G. (Argonne National Lab., IL (USA); Illinois Inst. of Tech., Chicago (USA). Dept. of Physics; Oregon Univ., Eugene (USA). Inst. of Theoretical Physics; State Univ. of New York, Stony Brook (USA). Inst. for Theoretical Physics). 1986. Contract W-31-109-ENG-38. 13p. (CONF-860168—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009181.

From Workshop on observable standard model physics at the SSC; Los Angeles, CA, USA (15 Jan 1986).

Events in high energy hadron collisions are discussed that contain a hard scattering, in the sense that very heavy quarks or high P/sub T/ jets are produced, yet are diffractive, in the sense that one of the incident hadrons is scattered with only a small energy loss. 12 refs., 6 figs.

30849 (CEA-CONF—8070) Particle physics and gauge theories. Morel, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). [1985]. 110p. (SPh-T—85-105). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751364.

These notes are intended to help readers not familiar with particle physics in entering the domain of gauge field theory applied to the so-called standard model of strong and electroweak interactions. The introduction is considerably enlarged in order to give non specialists a general overview of present days "elementary" particle physics. The Glashow-Salam-Weinberg model is then treated, with the details which its unquestioned successes deserve, most probably for a long time. Finally SU(5) is presented as a prototype of these developments of particle physics which aim at a unification of all forces. Although its intrinsic theoretical difficulties and the non-observation of a sizable proton decay rate do not qualify this model as a realistic one, it has many of the properties expected from a "good" unified theory. In particular, it allows one to study interesting connections between particle physics and cosmology. 35 refs.

30850 (CERN-EP—86-27) Heavy flavour photoproduction and decay. Barate, R. (European Organization for Nuclear Research, Geneva (Switzerland)). 21 Feb 1986. 12p. (CONF-8509280—2). NTIS (US Sales Only), PC A02/MF A01. File Number DE86901259.

From 2. Hellenic school on elementary particle physics; Corfu, Greece (1 Sep 1985).

Heavy flavour decays is the ideal place to measure weak couplings and mixing angles of heavy quarks; moreover, at these very short distances, the interplay between weak and strong interactions can be studied. Due to the unexpected experimental difference of lifetime between D^0 and D^+, the effect of the remaining light quark has also to be taken into account; the situation is evolving fast with measurements of new decay modes for charm and beauty. The production of heavy flavours by photons can be considered as a good test of a simple QCD process: the photon-gluon fusion, where the high mass of the produced quark allows perturbative calculations. It can be compared with the Vector Dominance Model (VDM) predictions. With inelastic psi photoproduction, second order QCD processes can be measured. These lectures were divided in four parts: charm decays, beauty decays, photoproduction mechanisms and experimental methods. 67 refs., 5 figs.

30851 (DOE/ER/04928—7) Partial wave analysis of π-N, NN, and KN scattering below 2 GeV. Progress report, June 1, 1979-May 31, 1980. Arndt, R.A.; Roper, L.D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics). Aug 1980. Contract AS05-76ER04928. 9p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009806.

Activities are reported with respect to the Scattering Analyses Interactive Dial-in (SAID) Facility. The facility provides scattering analysis solutions for nucleon-nucleon scattering, pion-nucleon scattering, and kaon plus-nucleon scattering. Data base management, partial wave analysis, modeling, and calculation of reaction cross sections are reported for nucleon-nucleon elastic scattering. Analyses were performed for pion-nucleon elastic scattering from 0 to 350 MeV. Effort is reported in the development of a new parameterization for unusual resonances of kaon plus-nucleon elastic scattering. Pion-nucleon inelastic scattering, particularly that which produces a pion, is also being analyzed by partial-waves, the current effort being the single-energy analyses of the world data. A Center for Analyses of Particle Scattering is being organized. (LEW)

30852 **(DOE/ER/04928—8) Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1980-April 30, 1981.** Arndt, R.A.; Roper, L.D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics). Aug 1981. Contract AS05-76ER04928. 8p. NTIS, PC A02. File Number DE86009807.

Activities are reported with respect to the Scattering Analyses Interactive Dial-in (SAID) Facility, which provides scattering analyses solutions for nucleon-nucleon scattering, pion-nucleon scattering, and kaon plus-nucleon scattering. With respect to nucleon-nucleon elastic scattering partial wave analysis, progress is reported in the areas of data base management, analysis, modeling, and calculation of reaction cross sections. Pion-nucleon elastic scattering was also analyzed from 0 to 350 MeV. Work on kaon plus-nucleon scattering analyses is reported. Some work is also reported on pion-nucleon inelastic analysis, particularly in the determination of the π-δ-δ coupling constant. (LEW)

30853 **(DOE/ER/04928—10) Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1982-April 30, 1983.** Arndt, R.A.; Roper, L.D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics). Aug 1983. Contract AS05-76ER04928. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009805.

Progress and proposals for future work are given in the partial wave analysis of nucleon-nucleon elastic scattering, kaon plus-nucleon elastic scattering, and pion-nucleon elastic and inelastic scattering. Activities are also required with respect to the Scattering Analysis Interactive Dial-in (SAID) facility. (LEW)

30854 **(DOE/ER/04928—11) Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1983-April 30, 1984.** Arndt, R.A.; Roper, L.D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics). Aug 1984. Contract AS05-76ER04928. 4p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009812.

Progress and proposed future work are briefly described in the partial wave analysis of kaon plus-nucleon scattering and pion-nucleon elastic and inelastic scattering. Activities are also reported with respect to the Scattering Analysis Interactive Dial-in (SAID) system. (LEW)

30855 **(DOE/ER/04928—12) Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1984-April 30, 1985.** Arndt, R.A.; Roper, L.D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Aug 1985. Contract AS05-76ER04928. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009801.

Progress is reported in the partial wave analysis of nucleon-nucleon elastic scattering, pion-nucleon elastic scattering, and kaon plus-nucleon elastic scattering. Activities are also reported with respect to the Scattering Analysis Interactive Dial-in (SAID) facility. (LEW)

30856 **(DOE/ER/04928—13) Partial wave analyses of hadron scattering below 2 GeV. Progress report, May 1, 1985-April 30, 1986.** Arndt, R.A.; Roper, L.D. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics). Jan 1986. Contract AS05-76ER04928. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009800.

Progress is reported in the areas of nucleon-nucleon scattering partial wave analysis, pion-nucleon elastic scattering partial wave analysis, kaon plus-nucleon elastic scattering partial wave analysis, the Scattering Analysis Interactive Dial-in (SAID) Facility. (LEW)

30857 **(IC—84/247) Low-energy hadron physics in the virton quark model.** Dineykhan, M.; Dubnickova, A.Z.; Efimov, G.V.; Ivanov, M.A. (International Centre for Theoretical Physics, Trieste (Italy); Komenskeho Univ., Bratislava (Czechoslovakia); Joint Inst. for Nuclear Research, Dubna (USSR)). Dec 1984. 68p. NTIS (US Sales Only), PC A04/MF A01. File Number DE86701787.

We propose a virton-quark model, which satisfies all axioms of relativistic quantum field theory and has no ultraviolet divergences. The model is based on the assumption that quarks do not exist (in general) as ordinary physical particles but only as virtual states, i.e. they represent some quasi-particles, which realize hadron interactions. Hadrons are bound states of quarks and are described by standard quantized fields. After introducing Lagrangians of hadron-quark interactions, some strong, electromagnetic and weak decays as well as low-energy scattering form factors of different types and static properties of hadrons are studied. In the model there are only two free parameters which define the quark propagators. A good description of the experimental data has been achieved.

30858 **(IC—85/34) Stability of SU(2) monopole in the presence of chiral fermions analysed on computers.** Bohr, H.; Khan, I. (International Centre for Theoretical Physics, Trieste (Italy)). Apr 1985. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701788.

Stability of SU(2) monopole in the presence of chiral fermions is investigated for a restricted class of variations using a hybrid analogue-digital computer.

30859 **(IC—85/42) Proton decay via d=5 gluino dressed graphs with flavour diagonal gluino couplings in supergravity models.** McDonald, J.; Vayonakis, C.E. (International Centre for Theoretical Physics, Trieste (Italy)). Apr 1985. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701783.

We calculate the proton decay rate for the mode p→K^+ ν-barsub(μ) in the minimal SU(3)xSU(2)xU(1) supergravity model, with flavour diagonal squark-quark-gluino couplings dressing d=5 operators. It is shown that, for reasonable ranges of parameters, the decay rate may be close to the present limits. This possibly requires that the vev's of the Higgs doublets be similar. Comparison with flavour changing couplings indicates that the diagonal case will be dominant, except if the third generation mixing angles are close to their upper bounds.

30860 **(IC—85/63) Charged-particle multiplicity distributions in e^+e annihilation and negative binomial distributions.** Chew, C.K.; Lim, Y.K. (International Centre for Theoretical Physics, Trieste (Italy)). Jun 1985. 11p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701782.

A negative binomial distribution is shown to fit the available charged-particle multiplicity distributions of e^+e annihilation into hadrons excellently. A remarkably excellent agreement is also obtained between the theory and experiment in respect of the second, third, fourth and fifth scaled moments. Slow increase in violation of KNO scaling is seen as the energy increases at three different energies $\sqrt{s}$=14, 22 and 34 GeV.

30861 **(IC—85/66) Do superstrings lead to quarks or to preons.** Huebsch, T.; Hitoshi Nishino; Pati, J.C. (International Centre for Theoretical Physics, Trieste (Italy)). Jun 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701789.

We propose that the fundamental four dimensional fields of the superstring theories be identified with preons. This can help preserve the most elegant features of the superstring theories while circumventing the possible difficulties such as rapid proton-decay, associated with a quark-lepton identification, of the fields. It is observed that a recently suggested preon-model possessing the desirable features of family-replication and inter-family mass-hierarchy can naturally emerge from the E_8xE_8 superstring theory.

30862 **(IC—85/75) On the hadron as a microuniverse.** Bernido, C.C. (International Centre for Theoretical Physics, Trieste (Italy)). Jun 1985. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701784.

A strongly curved microuniverse picture of a hadron is pursued. A gauge formulation of the microuniverse reveals the presence of instantons which are associated with a uniformly curved geometry. An investigation of the instanton coupling constant in relation with a hadronic matter shows that asymptotic freedom in a microuniverse picture of a hadron is possible in domains where quarks can be taken to be massless.

30863 (IFUSP-P—544) **Statistical principle and the quarks.** Cattani, M.S.D.; Fernandes, N.C. (Sao Paulo Univ. (Brazil). Inst. de Fisica). 1985. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701790.

Fundamental considerations of indistinguishability in quantum mechanics lead to the possibility of existence of three kinds of particles (bosons, fermions and gentileons) in nature. This is expressed in terms of a Statistical Principle. Assuming that quarks are spin 1/2 gentileons it is seen that quantum chromodynamics can be used, with additional conditions, to estimate the properties of gentilionic hadrons.

30864 (INS—525) **Mass hierarchies of quarks and leptons in a supersymmetric SP(2N) subcolor theory.** Takeshita, Seiichiro; Yasue, Masaki. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Dec 1984. 43p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701791.

The problem of quark and lepton generations as well as quark and lepton mass hierarchies is studied in the framework of supersymmetric chiral subquark models. A confining force arises from an SP(2N) gauge theory, in which supersymmetry does not undergo dynamical breakdown. We show models with quasi Nambu-Goldstone fermions and massless composite fermions protected by chiral symmetries, some of which form generations of quarks and leptons that are expected to exhibit mass hierarchies.

30865 (IPNO-TH—85-07) **Non-leptonic hyperon decays in the chiral bag model.** Oteo, J.A.; Noguera, S. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Feb 1985. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86751598.

$\Delta S=1$ non-leptonic hyperon decay amplitudes are calculated within a recently developed scheme, whose theoretical support is the chiral bag model. This model is not only used to describe baryons, but also to incorporate the weak interactions via SU(2)sub(L) x U(1) local gauge invariance of its Lagrangian. Experimental amplitudes are well reproduced for a bag radius of approximately 65 fm.

30866 (KEK—83-12, pp 46-50) **Simple picture of Rubakov-Callan effects.** Kobayashi, Makoto. (National Lab. for High Energy Physics, Oho, Ibaraki, Japan). Jul 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434. (CONF-8210345—).

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

30867 (KEK—83-12, pp 1-45) **Introduction to monopole-fermion dynamics.** Kazama, Yoichi. (Kyoto Univ., Japan. Dept. of Physics). Jul 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434. (CONF-8210345—).

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

A rudimentary account of monopoles is given in this text, placing emphasis on their interaction with fermions. The discussion starts from an abelian monopole. The vector potential which characterizes the magnetic field does not really describe an isolated monopole, but rather a monopole with an infinitely long string of magnetic flux. Wu and Yang pointed out that the string can be removed. What makes the physics of the charge-monopole system extraordinary is the appearance of extra angular momentum. The angular eigenfunctions are different from the ordinary spherical harmonics. The coupling of the extra angular momentum to the spin of a charged Dirac particle leads to the helicity flip scattering for the state with the lowest total angular momentum. A dyonlike bound state is found. The topology of Dirac equation in the monopole field is introduced to understand the state with the lowest angular momentum. Brief description of the non-abelian monopoles are presented. A monopole in SU(5) grand unified theories a la Dokos and Tomaras, which is the simplest circumstance of the coupling of the monopole to a fermion multiplet is discussed. The discussion on the SU(2) doublet fermions in the presence of a monopole (dyon) is also presented.

30868 (KEK—84-12, pp 1-23) **Proton decay in grand unified theories.** Hioki, Zenro. (Kyoto Univ., Japan. Dept. of Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

A review on the recent status of proton decay studies in the SU(5) and the SO(10) grand unified theories is presented.

30869 (KEK—84-12, pp 452-456) **Composite quasi Nambu-Goldstone fermions.** Yanagida, T. (Tohoku Univ., Sendai, Japan. Coll. of General Education). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

30870 (KEK—84-12, pp 61-77) **Issues in monopole-catalyzed proton decay.** Kazama, Yoichi. (National Lab. for High Energy Physics, Oho, Ibaraki, Japan). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

Some of the unsettled issues in monopole-catalyzed proton decay are discussed, following a short pedagogical review for non-experts.

30871 (KEK—84-12, pp 376-380) **Proton decay in supersymmetric models.** Sakai, N. (Tokyo Inst. of Tech., Japan. Dept. of Physics). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

30872 (LA-UR—86-1233) **Massive neutrinos in particle physics and astrophysics.** Rosen, S.P. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 35p. (CONF-860167—4). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86010176.

From Recontres de Moriond workshop on massive neutrinos in particle physics and astrophysics; Tignes, Savoie, France (25 Jan 1986).

The concepts of Majorana and Dirac neutrinos are reviewed from an operational point of view and survey the experimental search for neutrino mass. Also reviewed are the work of Mikheyev and Smirnov on the enhancement of neutrino oscillations via the mechanism of Wolfenstein matter oscillations. Results of an extensive computation of MSW effects in the sun are described. 41 refs., 6 figs.

30873 (LAL—85-29) **Some aspects of the physics at LEP with the Delphi detector.** Roudeau, P. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Jul 1985. 80p. (CONF-8504213—1). NTIS (US Sales Only), PC A05/MF A01. File Number DE86751601.

From 12. international winter meeting on fundamental physics; Cuenca, Spain (22 Apr 1985).

After a brief presentation of the Delphi apparatus we consider the three great areas which are at the origin of the collaboration name: a Detector with, Lepton, Photon, Hadron, Identification. In each case we describe the concerned apparatus components and illustrate the interest of such measurements for some important physics channels.

30874 (LAL—85-35) **Measurement of the F_2sup(γ) photon structure function at LEP.** Cordier, A. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Sep 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86751599.

Theoretical predictions on the F_2 structure function are actually rather controversial but agree on the necessity of high Q^2 measurements. LEP 1 and still more LEP 2 still provide the unique possibility of reaching high Q^2 and W^2 ranges, with good statistics,

allowing reliable QCD tests. From the experimental point of view, the F_2 measurement requires the definition of adapted triggers in the forward region of the detectors, which can be rather difficult due to the important "background" of the other $\gamma\gamma$ reactions.

30875 (RAL—85-077) Jet fragmentation. Saxon, D.H. (Rutherford Appleton Lab., Chilton (UK)). Oct 1985. 47p. (CONF-850721—23). NTIS (US Sales Only), PC A03/MF A01. File Number DE86701785.

From International Europhysics conference on high energy physics; Bari, Italy (18 Jul 1985).

The paper reviews studies on jet fragmentation. The subject is discussed under the topic headings: fragmentation models, charged particle multiplicity, bose-einstein correlations, identified hadrons in jets, heavy quark fragmentation, baryon production, gluon and quark jets compared, the string effect, and two successful models.

30876 (UWThPh—85-23) SVZ, gluon condensate and potential models. Bertlmann, R.A. (Vienna Univ. (Austria). Inst. fuer Theoretische Physik). 1985. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701786.

We review the attempts to represent the gluon condensate of Shifman, Vainshtein and Zakharov by a quark-antiquark potential.

30877 (UWThPh—85-24) Proton decay: theory versus experiment. Lucha, W. (Vienna Univ. (Austria). Inst. fuer Theoretische Physik). 1985. 48p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701781.

This review scrutinizes the present status of proton decay in grand unified theories. Baryon and lepton number violation in conventional as well as supersymmetric GUTs is discussed with special emphasis being laid on selection rules and model-independent predictions. The theoretical predictions for nucleon lifetimes and branching ratios, when confronted with experiment, inevitably lead to the conclusion that all great desert GUTs, like the minimal SU(5) model, are definitely ruled out by the experimental non-confirmation of proton decay at the expected rate.

30878 QCD prediction for charmonium production in anti pp collisions. Berger, E.L.; Damgaard, P.H.; Tsokos, K. (Argonne National Lab., Argonne, IL 60439). pp 349-354 of Antiproton 1984. Accord, MA; Adam Hilger Ltd. (1985). (CONF-840795—).

From 7. European symposium on antiproton interactions; Durham, UK (9 Jul 1984).

Within the framework of perturbative QCD, the formalism of exclusive processes is used to give predictions for the production cross section of charmonium resonances.

6453 Particle Invariance Principles And Symmetries

REFER ALSO TO CITATION(S) 30849

6454 Field Theory

REFER ALSO TO CITATION(S) 30857, 30859, 30861, 30862, 30863, 30864, 30867, 30868, 30871, 30877, 30878

30879 (CEA-N—2428) About the obtention of static critical behaviours from the renormalization group techniques of field theory. Bervillier, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Mar 1985. 142p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751620.

These lecture notes on static critical phenomena try, as far as possible, to show the link between the physics of second order phase transitions and the techniques of renormalization within field theory. We especially insist on the relative influence of various parameters (cut-off and couplings) which characterize the real systems within a same class of universality defined by spatial dimension (d) and symmetry order (n). The techniques of calculations of the critical exponents are given in great detail (obtention of γ at order epsilon = 4-d for any n).

30880 (FNAL/Pub—86/38-A) Stable compactifications. Accetta, F.S.; Gleiser, M.; Holman, R.; Kolb, E.W. (Chicago Univ., IL (USA). Enrico Fermi Inst.; Fermi National Accelerator Lab., Batavia, IL (USA)). Mar 1986. Contract AC02-76CH03000. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009989.

We show that compactifications of theories with extra dimensions are unstable if due to monopole configurations of an antisymmetric tensor field balanced against one-loop Casimir corrections. In the case of ten dimensional supergravity, it is possible, at least for a portion of the phase space, to achieve a stable compactification without fine-tuning by including the contribution of fermionic condensates to the monopole configurations. 23 refs., 2 figs.

30881 (ICTP-IC—85/253) Critical dimensions for strings in a curved background. Bergshoeff, E.; Sarmadi, H.; Sezgin, E. (International Centre for Theoretical Physics, Trieste (Italy); International School of Advanced Studies, Trieste (Italy)). Nov 1985. 22p. (CONF-8506242—2). NTIS (US Sales Only), PC A02. File Number DE86901309.

From Cambridge workshop on supersymmetry and its applications; Cambridge, UK (23 Jun 1985).

The derivation is reviewed of the critical dimensions for bosonic/fermionic strings moving in d dimensional Minkowski spacetime times a group manifold. The mass spectrum is also discussed. 18 refs.

30882 (ICTP-IC—85/284) Superconformal invariance and the tensor multiplet in six dimensions. Bergshoeff, E. (International Centre for Theoretical Physics, Trieste (Italy)). Nov 1985. 7p. (CONF-8509284—1). NTIS (US Sales Only), PC A02/MF A01. File Number DE86901302.

From 1. Torino meeting on superunification and extra dimensions; Torino, Italy (23 Sep 1985).

The complete structure of $N = 2$ conformal supergravity is presented in six dimensions. The relation with the graded algebra Osp(6,2/1) is discussed. It is shown that there exist two different formulations of $N = 2$, $d = 6$ conformal supergravity. These two formulations are shown to be equivalent by using some special properties of the $N = 2$, $d = 6$ tensor multiplet. 16 refs.

30883 (KEK—83-12, pp 119-134) Grand unification mass scale and proton life time in SO(10) model. Yamamoto, Noboru. (Osaka Univ., Toyonaka, Japan. Dept. of Physics). Jul 1983. NTIS (US Sales Only), PC A05/MF A01. File Number DE86780434. (CONF-8210345—).

From Workshop on monopoles and proton decay; Kamioka, Gifu, Japan (18 Oct 1982).

We study super heavy gauge boson mass threshold effect and derive formulas for grand unification mass scale and the Weinberg angle in SO(10) GUT. Proton life time is estimated by the obtained formula. Relation with the formula derived by L. Hall is also discussed.

30884 (KEK—84-12, pp 381-387) Mass of superpartners in SGUT. Komatsu, H. (Tokyo Univ., Tanashi, Japan. Inst. for Nuclear Study). Sep 1984. NTIS (US Sales Only), PC A11/MF A01. File Number DE86780447. (CONF-8312132—).

From Workshop on grand unified theories and cosmology; Oho, Ibaraki, Japan (7 Dec 1983).

30885 (RAL—85-056) Gauge theories in loop space. Chan, H.M.; Tsou, S.T. (Rutherford Appleton Lab., Chilton (UK); Oxford Univ. (UK). Mathematical Inst.). Jul 1985. 18p. (CONF-8406328—1). Rutherford Appleton Laboratory Chilton, Didcot, Oxon, OX11 OQX, England. File Number TI86901218.

From 24. Cracow School of Theoretical Physics conference; Zakopane, Poland (1 Jun 1984).

Pure Yang-Mills theory is reformulated in terms of gauge-independent loop variables whose intrinsic redundancy is removed using a newly derived nonabelian generalization of the Poincare lemma.

30886 **(RAL—85-057) Constrained Lagrangian theory for monopoles.** Chan, H.M.; Tsou, S.T. (Rutherford Appleton Lab., Chilton (UK); Oxford Univ. (UK). Mathematical Inst.). Jul 1985. 22p. (CONF-8406328—2). Rutherford Appleton Laboratory, Chilton, Didcot, Oxon, OX11 OQX, England. File Number TI86901224.

From 24. Cracow School of Theoretical Physics conference; Zakopane, Poland (1 Jun 1984).

The equations of motion of a non-abelian monopole are derived from an action principle using the definition of its charge as a constraint. These equations are the analogues of the Lorentz and Maxwell equations for a point charge in an electromagnetic field. Their derivation makes use exclusively of the intrinsic topology and dispenses with the introduction of an interaction term in the action. The resulting equations bear a formal resemblance to the Wong equations governing the motion of a classical point source in a Yang-Mills field.

30887 **(SLAC-PUB—3902) String primer.** Bachas, C. (Stanford Linear Accelerator Center, Menlo Park, CA (USA)). Mar 1986. Contract AC03-76SF00515. 9p. (CONF-8509280—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009198.

From 2. Hellenic school on elementary particle physics; Corfu, Greece (1 Sep 1985).

This is an elementary introduction to the classical and quantum mechanics of a single bosonic string, and to some aspects of its supersymmetric and heterotic extensions. 22 refs.

6455 Scattering Theory

30888 **(N—86-17140) Single scattering from nonspherical Chebyshev particles: a compendium of calculations.** Wiscombe, W.J.; Mugnai, A. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jan 1986. 282p. (NASA-RP—1157; REPT—613). NTIS, PC A13/MF A01.

A large set of exact calculations of the scattering from a class of nonspherical particles known as Chebyshev particles' has been performed. Phase function and degree of polarization in random orientation, and parallel and perpendicular intensities in fixed orientations, are plotted for a variety of particles shapes and sizes. The intention is to furnish a data base against which both experimental data, and the predictions of approximate methods, can be tested. The calculations are performed with the widely-used Extended Boundary Condition Method. An extensive discussion of this method is given, including much material that is not easily available elsewhere (especially the analysis of its convergence properties). An extensive review is also given of all extant methods for nonspherical scattering calculations, as well as of the available pool of experimental data.

65 PHYSICS II

REFER ALSO TO CITATION(S) 30762

6510 Nuclear Physics

30889 **(AERE-R—11849) Harwell version of the DLC37F nuclear data library.** Baker, L.J.; Taylor, N.P. (UKAEA Atomic Energy Research Establishment, Harwell. Materials Physics and Metallurgy Div.). Jul 1985. 21p. H.M. Stationery Office, London, price Pound 4.00.

The linked neutron-photon cross-section library designated DLC37 and distributed by the Radiation Shielding Information Service, Oak Ridge National Laboratory, has been extended at Harwell to cover a greater range of nuclides and to provide an extensive range of reaction rate edit facilities. This report describes the current version of the library.

30890 **(DOE/ER/40020—T2) Assessment of the current status of basic nuclear data compilations.** (National Research Council, Washington, DC (USA). Numerical Data Advisory Board). 18 Apr 1986. Contract FG01-81ER40020. 21p. NTIS, PC A01/MF A01; GPO Dep. File Number DE86009771.

Status of mass-chain evaluations, publication format in Nuclear Data Sheets, remote terminal access to nuclear data and references, and other USNDN publications are discussed. 1 tab. (DWL)

30891 **(NEANDC(E)—262-U-Vol.3-EURATOM) Annual progress report on nuclear data, 1984. Volume 3.** Debus, G.H. (ed.). (Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements). 1984. 123p. (INDC(EUR)—0191G). NTIS (US Sales Only), PC A06/MF A01. File Number DE86901253.

Summaries are provided of research dealing with nuclear data for standards, for fission technologies and for fusion technologies. Included are experimental, evaluated, and/or theoretical data dealing with alpha, gamma, photon, K x-ray, and L x-ray emission probabilities; fission fragment mass distributions and kinetic energies, neutron capture cross sections, and isotope reaction cross sections of importance to fission and fusion research and engineering. Progress on radionuclide, neutron flux, and dose methodology is also presented. Characteristics of liquid scintillation and solid state radiation detectors and systems are discussed; specifically, responses of such detectors to various radiation sources and conditions are addressed. 39 figs., 22 tabs. (DWL)

6512 Nuclear Properties And Reactions, A=1-5, Theoretical

REFER ALSO TO CITATION(S) 30945

30892 **(CEA-CONF—8043) Pion photoproduction in nuclei.** Botton, N. de. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Jun 1985. 18p. (CONF-850634—3; DPh-N-S—2297). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751605.

From International school for intermediate energy nuclear physics; Veronna, Italy (20 Jun 1985).

Pion photoproduction experiments are discussed in connection with experimental techniques used for the photon source and the pion detection. After presenting the physical motivations and the theoretical frame of interpretation, on a few significant experiments displaying different aspects of the field are reported.

30893 **(INS—520) Nuclear collision theory with many-body correlations, 2. Deuteron+deuteron elastic scattering.** Kurihara, Yukio. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Dec 1984. 43p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701805.

A nuclear collision theory, in which the many-body correlation induced by the strong short-ranged repulsion and medium-ranged attraction of the realistic NN interaction is explicitly included, is applied to the deuteron+deuteron elastic scattering at low energies. Pair correlation functions calculated by the present theory are very different from the one of Hackenbroich et al. They contain not only the short-ranged suppressive correlation, but also the medium-ranged enhancing correlation. The former changes the shape of the d-d potential from the wine-bottle one, and the latter makes the d-d potential much more attractive. This effect is necessary for reproducing a bump around theta ub(cm)=90^0 in the experimental elastic differential cross section. The phase shifts evaluated by the present theory are compared with those from the resonating-group method.

30894 **(INS—522) Experiments using beams of unstable nuclear isotopes. Interaction cross sections and the radii of He isotopes.** Tanihata, Isao. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Dec 1984. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701808.

Secondary beams of ^{3}He, ^{4}He, ^{6}He, and ^{8}He were produced through the projectile fragmentation of 800MeV/nucleon ^{11}B primary. Interaction cross sections (σ sub(I) of all He isotopes on Be, C, and Al targets were measured by a transmission-type experiment. The interaction nuclear radii of He isotopes, R(He)=$\sqrt{\sigma}$ sub(I)/π-R(T) where R(T) is of the target nucleus, have been deduced from the present σ sub(I) and the known σ sub(I) of ^{4}He+^{4}He reactions.

30895 **(INS—526) Measurements of interaction cross sections and radii of He isotopes.** Tanihata, I.; Hamagaki, H.; Hashimoto, O. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). 17 Jan 1985. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701807.

Secondary beams of ^{3}He, ^{4}He, ^{6}He, and ^{8}He were produced through the projectile fragmentation of 800MeV/nucleon ^{11}B primary. Interaction cross sections (σ sub(I)) of all He isotopes on Be, C, and Al targets were measured by a transmission-type experiment. The interaction radii of He isotopes, R(He)=$\sqrt{\sigma}$ sub(I)/π-R(T) where R(T) is of the target nucleus, have been deduced from the present σ sub(I) and the known σ sub(I) of ^{4}He+^{4}He and ^{12}C+^{12}C reactions; R(^{3}He)=1.59+-0.06, R(^{4}He)=1.40+-0.05, R(^{6}He)=2.21+-0.06, and R(^{8}He)=2.52 +- 0.06 in fm.

6513 Nuclear Properties And Reactions, A=6-19, Theoretical

30896 **(DOE/ER/03244—121) Nonleptonic weak interactions in hypernuclei.** Barnes, P.D. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics). 1985. Contract AC02-76ER03244. 24p. (CONF-850921—12). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009675.

From 5. international conference on hypernuclear and kaon physics; Upton, NY, USA (9 Sep 1985).

The nonmesonic reaction: $\Lambda N \rightarrow NN$ is discussed as an example of a nonleptonic weak process. Calculations of the reaction rate for this process have been reported using various effective weak Hamiltonians. These predictions are compared with the results of a new investigation of this interaction at the AGS in the context of weak hypernuclear decay. Measurements of hypernuclear lifetimes and neutron stimulated fractions for nonmesonic decay are reported for /sub Λ/^{12}C and /sub Λ/^{11}B. 21 refs., 15 figs., 5 tabs.

30897 **(IPNO-T—83-04) Study of some direct reactions at 0° in ^{18}O+^{26}Mg and ^{18}O+^{12}C systems.** Payet, J. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire; Paris-11 Univ., 91 - Orsay (France)). 1984. 130p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751619.

Direct transfer reactions induced by a ^{18}O beam on ^{12}C and ^{26}Mg targets, have been studied at the MP tandem (Orsay) with an experimental set up giving the possibility to have angular distributions up to 0°. Transfer reactions to discrete levels were analysed in the D.W.B.A. framework. This analysis confirms the interest as a spectroscopic tool of this 0° measurements. The (^{18}O, ^{18}O) and (^{18}O, ^{20}Ne) reactions were observed up to 40 MeV excitation energy. A diffractionnal model, including the one step direct transfer hypothesis, gives a qualitative agreement with the angular distributions and the energy spectra. A parametrization of a specific small angles development of the transfer amplitudes does not give good results with physical values for the parameters. 32 refs.

30898 **(ISN—85-05) Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon.** Kox, S. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires; Grenoble-1 Univ., 38 (France)). 1985. 133p. (In French). NTIS (US Sales Only), PC A07/MF A01. File Number DE86751616.

We have developed a new experimental set-up for the direct measurement of the total reaction cross sections (σsub(R)) using the beam attenuation method. Experiments have been performed in the energy range from 30 to 300 MeV/nucleon (MeV/n) using the recently delivered heavy ion beams of three accelerators (SARA, S.C. CERN and SATURNE). The experimental results are in strong disagreement with the predictions of the strong absorption models developed to reproduce the measured data at low energies. The decrease of σsub(R)) observed between 30 and 300 MeV/n clearly demonstrates the transparency effects in heavy ion collisions. The maximum of the transparency is observed around 300 MeV/n independently of the studied system. The different variations of σsub(R)) as a function of the incident energy and of the mass of the colliding systems are fairly well reproduced in the framework of a simple microscopic model. These results linked the transparency in the nucleus-nucleus collisions to the behaviour of the total cross sections for individual nucleon-nucleon (N-N) interactions. In this work it is also demonstrated the important role played by the mass asymmetry of the colliding system in the variations of σsub(R)). This latter effect has been explained with pure geometrical arguments. A new parametrization for σsub(R)) is proposed to reproduce the data measured over the energy range 30 to 2100 MeV/n. 99 refs.

30899 **(JAERI-M—84-163) Neutron nuclear data of ^{7}Ni adopted in JENDL-2.** Shibata, Keiichi. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Aug 1984. 39p. (INDC(JPN)—90/L; NEANDC(J)—104/U). NTIS (US Sales Only), PC A03/MF A01. File Number DE84901850.

Neutron nuclear data of ^{7}Li were evaluated for JENDL-2 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, (n,γ), (n,n')αt reaction cross sections and the angular distributions of neutrons. The present evaluation was completely based on available experimental data. 30 refs.

30900 **(JAERI-M—84-165) Neutron nuclear data of ^{9}Be adopted in JENDL-2.** Shibata, Keiichi; Ioki, Kimihoro. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Sep 1984. 41p. (NEANDC(J)—105/U; INDC(JPN)—91/L). NTIS (US Sales Only), PC A03/MF A01. File Number DE84901864.

Neutron nuclear data of ^{9}Be were evaluated for JENDL-2 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic scattering, (n,2n), (n,γ), (n,p), (n,d), (n,t) and (n,α) reaction cross sections and the angular and energy distributions of emitted neutrons. The present evaluation was completely based on available experimental data. 40 refs.

30901 **(JAERI-M—84-198) Evaluation of neutron nuclear data of ^{6}Li for JENDL-3.** Shibata, Keiichi. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Nov 1984. 65p. (INDC(JPN)—94/GL; NEANDC(J)—108/AU). NTIS (US Sales Only), PC A04/MF A01. File Number DE85901060.

Neutron nuclear data of ^{6}Li have been evaluated for JENDL-3 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, radiative capture, photon-production, (n,2n), (n,p) and (N,α) reaction cross sections and the angular and energy distributions of secondary neutrons. The total, elastic scattering and (n,α) cross sections below 1 MeV have been calculated on the basis of the R-matrix theory. Two discrete levels were taken into account for the inelastic scattering. The double-differential cross sections for the (N,2n) reaction and the inelastic scattering to the continuous levels were obtained from the phase-space model calculations. 45 refs.

30902 **(JAERI-M—84-204) Evaluation of neutron nuclear data of ^{7}Li for JENDL-3.** Shibata, Keiichi. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Nov 1984. 50p. (NEANDC(J)—109/U; INDC(JPN)—95/L). NTIS (US Sales Only), PC A03/MF A01. File Number DE85900705.

Neutron nuclear data of ^{7}Li have been evaluated for JENDL-3 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, radiative capture, photon-production, (n,2n), (n,d) and (n,n')αt reaction cross sections and the angular and energy distributions of secondary enutrons. For the inelastic scattering two discrete levels were taken into consideration. The energy-angle distributions of neutrons from

the inelastic scattering to continuum and the (n,2n) reaction were calculated with the three-body phase-space model. 31 refs.

30903 **(JAERI-M—84-226) Evaluation of neutron nuclear data of ^{9}Be for JENDL-3.** Shibata, Keiichi. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Dec 1984. 83p. (INDC(JPN)—96/L; NEANDC(J)—110/U). NTIS (US Sales Only), PC A05/MF A01. File Number DE85901057.

Neutron nuclear data of ^{9}Be have been evaluated for JENDL-3 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, photon-production, (n,γ), (n,p), (n,d), (n,t) and (n,α) reaction cross sections and the angular and energy distributions of neutrons. The total cross section below 830 keV was calculated with the R-matrix theory. The statistical model was applied to the prediction of the inelastic scattering and charged-particle emission cross sections. The (n,2n) reaction cross section is given by the sum of the inelastic scattering and (n,α_1) reaction cross sections. 38 refs.

30904 **0^- to 0^+ beta decay in A = 16.** Gagliardi, C.; Freedman, S.J.; Garvey, G.T.; Wrobel, J.R. (Physics Division, Argonne National Laboratory, Argonne, IL). pp 579-586 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

J = 0^- to 0^+ transitions have been and continue to be of great interest in nuclear physics. They are extremely restrictive as to the form of the one-body operator that can cause the transition. This point focussed attention on measuring both muon capture and beta decay rates between 0^+ and 0^- levels to determine the induced pseudoscalar coupling in nuclei. The interest in these transitions of late has been due to the large role expected for pion exchange currents. The capture has been well studied, but the beta decay of the 0^- level to ^{16}O in A = 16 has only been measured once and contains great error. The measurement is difficult owing to the small branching ratio for beta decay. This report by the authors on the ^{16}N(0^-)-0^+ decay provides an excellent example of how contemporary understanding of nuclear structure extended to include meson exchange currents allows prediction of sensitive axial vector decay rates. The experimental data shows good agreement with the calculated rates if these currents are included.

6514 Nuclear Properties And Reactions, A=20-38, Theoretical

30905 (CONF-8509176—, pp H19) **Excitation of the Δ resonance in relativistic heavy ion charge exchange reactions.** Bachelier, D.; Boyard, J.L.; Hennino, T.; Jourdain, J.C.; Roy-Stephan, M.; Contardo, D.; Descroix, E.; Grossiord, J.Y.; Guichard, A.; Haroutunian, R. (Institute de Physique Nucleaire, Orsay, France). Nov 1985. NTIS MF A01. File Number DE86004599.

From Workshop on intermediate energy heavy ion physics; Oak Ridge, TN, USA (23 Sep 1985).

It has been possible to observe, for the first time, the excitation of the Δ resonance in relativistic heavy ion charge exchange reactions. The two mirror reactions ^{27}Al (^{20}Ne,^{20}Na) and ^{27}Al (^{20}Ne,^{20}F) have been studied at 950 MeV per nucleon. These first measurements have been performed at Laboratorie National Saturne using the magnetic spectrometer SPES IV at 0°.

30906 **(INS—521) Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions.** Tanihata, Isao. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Dec 1984. 18p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701809.

Two-proton coincidence spectra have been measured in a wide kinematical range for ^{20}Ne+NaF and ^{20}Ne+Pb collisions at 400MeV/nucleon. Coplanar-type correlations show different feature between Ne+NaF and Ne+Pb target reactions. A strong in-plane correlation, which correspond to quasi-elastic scatterings (QES) of nucleons, was observed in wide angular range (15-90°) in NaF target collisions. Angular distributions of QES were reproduced reasonably well by a single nucleon-nucleon scattering model. Enhancement of the QES at momentum transfer around t=2-3m sub(π), which is predicted as an indication of pionic instability, was not observed. In Ne+Pb collisions, an azimuthally asymmetric emission of particles with respect to the beam axis were implied by the anti-coplanar correlation. A new type of coplanar correlation between the emission angle and the momentum suggests a back-to-back emission of projectile and target nucleons.

30907 (LBL—16870, pp 62-64) **Wide angle measurement of beta-delayed two-proton radioactivity of ^{22}Al.** Cable, M.D.; Honkanen, J.; Reiff, J.E.; Schloemer, E.C.; Zhou, S.H.; Zhou, Z.Y.; Cerny, J. (Univ. of Jyvaskyla, Finland). Aug 1984. NTIS, PC A16/MF A01. File Number DE85001035.

In Nuclear Science Division annual report, October 1, 1982-September 30, 1983.

With the discovery of beta-delayed two-proton radioactivity in ^{22}Al and ^{26}P, details of the mechanism of two-proton emission became of immediate interest. The original measurement of each isotope was made with a specially constructed particle telescope. This telescope was capable of observing proton-proton coincidences at relative angles of 0-70° (with varying efficiencies), and with a mean angle of ~ 40°. A second measurement at the widest practical angle was desirable in order to obtain more information on the angular correlation of the two protons. This measurement provides some information on the mechanism of two-proton emission. A two-proton summed energy spectrum from experiments at both wide and narrow angles for ^{22}Al is shown. It can be determined that the wide angle spectrum shows the kinematic shift expected for sequential decay; although this shows that sequential decay is indeed a major decay mode, the results do not eliminate the possibility that ^{2}He emission may also be present in the narrow angle data.

6515 Nuclear Properties And Reactions, A=39-58, Theoretical

30908 **(IC—85/74) Alpha-clustering in 75 MeV ^{16}O+^{40}Ca as a collective mass fragmentation process.** Gupta, R.K.; Malhotra, N.; Saroha, D.R. (International Centre for Theoretical Physics, Trieste (Italy); Punjab Univ., Chandigarh (India). Dept. of Physics). Jul 1985. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701803.

The observed α-cluster structure in the mass yield distribution of 75 MeV ^{16}O+^{40}Ca reaction is shown to be a collective mass transfer. This is given as a dynamical mass fragmentation process in the fusion-fusion of the compound nucleus ^{56}Ni. The experimental data is found to suggest the use of oscillating adiabatic cranking mass parameters. The coupling effect of relative motion to the mass asymmetry co-ordinate is also studied, which is found to be negligibly small.

6516 Nuclear Properties And Reactions, A=59-89, Theoretical

30909 **(CSNSM-T—84-01) Study of transitional Erbium nuclei (N=86) at very high spin. Highlight of dipolar transitions and medium lifetimes in the continuum.** Bogaert, G. (Paris-11 Univ., 91 - Orsay (France). Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse). 1984. 116p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751615.

Average lifetimes and multipolarities of unresolved transitions deexciting very high spin states of the light Rare Earth nuclei (N approximately 86) have been determined by a measure of Doppler shift attenuation and their anisotropy. The spin selection is provided by the total energy spectrometer technique; great care was taken of the existence of many long lived isomeric states in the studied nuclei. The N approximately 86 nuclei have been formed in the ^{84}Kr(340 MeV) + ^{74}Ge → ^{158}Er* reactions using the ^{84}Kr beam of the Orsay ALICE facilities and targets of ^{74}Ge built at the PARIS Isotope separator of the CSNSM. NaI γ spectra have been thoroughly cleared of the discrete lines contribution through a

careful subtraction procedure synthetising NaI spectra from the Ge ones. At very high spin the continuum γ rays feed two well separated bumps with Esub(γ) approximately .65 MeV and Esub(γ) approximately 1.3 MeV. The 1.3 MeV transitions appear at I > 30 h and their energy does not vary with the increasing spin like expected in the rotational case of the well deformed nuclei; they are strongly collectively enhanced with B(E2) > 130 W.u. Below 1 MeV the anisotropy of transitions is R approximately 0.7, indicating their stretched dipole nature. Recent calculations of nuclear shape deformation (following Strutinsky shell correction method) reproduce the two bumps shape of the experimental spectra and the origin of the excitation is explained in terms of nuclear vibration (γ-vibration, wobbling motion).

6517 Nuclear Properties And Reactions, A=90-149, Theoretical

30910 (ANU-P—927) Determination of B(E3;0_1i → 3_1) values for the stable isotopes of cadmium. Fewell, M.P.; Spear, R.H.; Adam, G.K.; Esat, M.T. (Australian National Univ., Canberra. Dept. of Nuclear Physics). May 1985. 16p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701810.

Values of B(E3;0_1^+ → 3_1) for the stable isotopes of Cd have been determined from particle spectra obtained using Coulomb excitation by ^{16}O projectiles. The results are: 0.16+-0.04 e^2b^3 (^{106}Cd), 0.0150+-0.010 e^2b^3 (^{108}Cd), 0.115+-0.013 e^2b^3 (^{110}Cd), 0.114+-0.009 e^2b^3 (^{112}Cd), 0.131+-0.015 e^2b^3 (^{114}Cd), and 0.100+-0.011 e^2b^3 (^{116}Cd). The corresponding E3 strengths are 34, 31, 23, 22, 24 and 18 single particle units, respectively. Examination of these and other data reveals no evidence for Shell effects in B(E3;0_1^+ → 3_1) values near the Z=50 proton shell, in contrast to the situation for B(E2;0_1^+ → 2_1^+) values.

30911 (IPNO-DRE—85-11) Gamma-decay of the 1gsub(9/2) and 2p inner-hole states in ^{111}Sn via the ^{113}Sn(^{3}He) reaction at 32 MeV. Azaiez, F.; Fortier, S.; Gales, S.; Hourani, E.; Maison, J.M.; Schapira, J.P.; Kumpulainen, J. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). 1985. 57p. NTIS (US Sales Only), PC A04/MF A01. File Number DE86751617.

The gamma-decay of the deeply-bound hole states in ^{111}Sn has been investigated at 32 MeV incident energy by means of the ^{113}Sn(^{3}He,αγ) reaction. The α-particles emitted near 0° were detected in a Si counter located at the image plan of the superconducting solenoidal spectrometer SOLENO. The γ-rays in coincidence with the α-particles were detected by two Ge(Li) detectors located at 90° and 142° with respect to the beam direction, respectively. Energies, spins and decay schemes have been established for the low-lying states up to 2.5 MeV excitation energy in ^{111}Sn. The γ-decay of the broad bump, located around 4.2 MeV and previously attributed to neutron pick-up from the inner 1gsub(9/2), 2psub(1/2) and 2psub(3/2) neutron subshells, reveals the importance of quasiparticle-phonons mixing in the spreading mechanism of the inner-hole strengths. The 1gsub(9/2) and 2p strength functions have been deduced from the γ-decay of the enhanced structures (3 <= Esub(x) <= 8 MeV). They are compared to the ones measured in previous inclusive neutron pick-up experiments and to those calculated in the framework of the quasiparticle-phonons nuclear model.

30912 (ISN—83-36) X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus. Liatard, E. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires; Grenoble-1 Univ., 38 (France)). 1984. 116p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751614.

The ionization of inner electronic shells can be used to determine the lifetime of a compound nucleus formed in a nuclear reaction. The principle of the measure is based on the comparison between the unknown lifetime of the nuclear process and the known lifetime of a K-shell vacancy created during the collision. Besides testing this method, which we call the "atomic-clok" method with the compound nucleus ^{112}Te formed by the reaction ^{20}Ne (205 MeV) + ^{92}Mo, the work in this thesis basically consists of a description and a study of the problems presented by the use of X-ray spectroscopy in nuclear-decay-time measurements and Z-identification of heavy nuclear products.

30913 (JAERI-M—84-117) Attempt for revision of JNDC FP Decay Data File. Katakura, Jun-ichi; Akiyama, Masatsugu; Yoshida, Tadashi; Matumoto, Zyun-itiro; Nakasima, Ryuzo. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Japanese Nuclear Data Committee). Jun 1984. 47p. (NEANDC(G)—103/U; INDC(JPN)—89/L). NTIS (US Sales Only), PC A03/MF A01. File Number DE84901729.

Some improvement of JNDC FP Decay Data File is tried by reexamining the decay scheme for several nuclides, since slight discrepancies are seen in detailed comparison of decay powers. As a result, it is found that the average beta- and gamma-energies should be modified for ^{88}Rb and ^{143}La among the nuclides reexamined in the present study. The JNDC file modified in ^{88}Rb and ^{143}La gives better agreement in most cases with experiments than the original JNDC file for cooling times longer than a few thousands seconds. Howver, the discrepancy for cooling times from a few hundreds to about 1500 seconds still remains. 10 refs., 27 figs.

6518 Nuclear Properties And Reactions, A=150-189, Theoretical

30914 (ANU-P—910) Angular momentum partition in heavy ion induced fission and the effects of shells on gamma-ray multiplicities. Leigh, J.R.; Phillips, W.R.; Newton, J.O.; Foote, G.S.; Hinde, D.J.; Dracoulis, G.D. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Jun 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701811.

Gamma-ray multiplicities have been measured following fission of nuclei with a wide range of mass and angular momentum. The average multiplicity reflects the total angular momentum of the fragments, but the observed variation of multiplicity with fragment mass asymmetry is dominated by shell effects. The highest average multiplicity arises from fission of the heaviest compound system, produced with the lowest angular momentum. This behaviour is well described by spin enhancement through statistical excitation.

30915 (ANU-P—918) Electron capture decay of ^{159}Tb. Dincklage, R.D. von; Hay, H.J. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Jul 1985. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701812.

Using a chemically and mass separated source of ^{159}Tb the decay to the 1187 KeV level in ^{159}Gd has been studied. The fraction of captures of electrons from the K-orbital was measured to be smaller than 5.2 x 10^8 and from the L-orbital to be 0.689 +- 0.010. Both observations are consistent with a ^{159}Tb - ^{159}Gd mass difference of 1222 +- 3 keV, thus rejecting a recent claim for a larger value.

30916 (ANU-P—925) Spectroscopy of ^{160}W and ^{167}W and alignment effects in very neutron-deficient tungsten nuclei. Gerl, J.; Dracoulis, G.D.; Byrne, A.P.; Poletti, A.R.; Poletti, S.J.; Stuchbery, A.E. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Jun 1985. 30p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701813.

High spin states in ^{160}W and ^{167}W were populated by the reactions ^{142}Nd (^{28}Si, 4n) ^{160}W, ^{142}Nd (^{28}Si, 3n) ^{167}W and ^{147}Sm (^{24}Mg, 4n) ^{167}W. From the gamma-decay of the yrast band and a side band (with assumed negative parity) were identified to high spins. There is evidence for a second side band in ^{167}W. The observed backbend of the yrast sequences and band crossing anomalies in the sidebands are discussed in conjuction with cranked-shell-model calculations. A systematic comparison is made between the yrast bands of ^{160}W, ^{167}W, ^{168}W in order to understand the structure of the second backbend in ^{160}W.

30917 (ANU-P—928) On the electron capture decay energies of ^{153}Gd and ^{175}Hf. Dincklage, R.-D. von. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Jul 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701814.

The electron capture Q-values of ^{153}Gd and ^{175}Hf are analyzed using properties of their beta decays to different levels belonging to the same rotational family in the daughter atoms. The results are Q=500+-sub(50)sup(100)keV for ^{153}Gd, and Q=700+-sub(50)sup(100)keV for ^{175}Hf. They agree with data from nuclear reactions but reject smaller values based on K capture probabilities.

30918 (IC—85/36) Microscopic study of the S band in the generator co-ordinate approach. Wuest, E.; Ansari, A. (International Centre for Theoretical Physics, Trieste (Italy)). Apr 1985. 8p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701800.

Using particle number and spin projected cranked Hartree-Fock-Bogolubov (CHFB) wave functions in the generator co-ordinate method (GCM) with the cranking frequency as a GC the shortcomings of the usual CHFB theory are removed and the ground as well as the s band are studied simultaneously. In particular, low-spin properties of the s band are discussed for a backbending nucleus ^{158}Dy.

6519 Nuclear Properties And Reactions, A=190-219, Theoretical

30919 (ANU-P—907) Quadrupole moment of ^{196}Pt - a crucial test of nuclear models. Fewell, M.P.; Gyapong, G.J.; Spear, R.H.; Esat, M.T.; Baxter, A.M.; Burnett, S.M. (Australian National Univ., Canberra. Dept. of Nuclear Physics). May 1985. 14p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701815.

The static electric quadrupole moment Q_2^+ and the $B(E2;0^+ \rightarrow 2^+)$ of the first excited state of ^{196}Pt have been determined using Coulomb excitation. The results are $Q_2^+ = 0.79 +- 0.12$ eb and $B(E2;0^+ \rightarrow 2^+) = 1.382 +- 0.006$ e^2b^2. The Bohr-Mottelson model and the 0(6) limit of the interacting boson model fail to reproduce these values when constrained to fit other known properties of ^{196}Pt.

30920 (ANU-P—923) Short lived isomers in ^{211}Rn and ^{210}Rn. Poletti, A.R.; Dracoulis, G.D.; Poletti, S.J.; Byrne, A.P.; Stuchbery, A.E.; Gerl, J. (Australian National Univ., Canberra. Dept. of Nuclear Physics). May 1985. 19p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701816.

Mean lives of excited states in ^{211}Rn and ^{210}Rn have been measured. For ^{211}Rn: 8169 keV (tau=3.3(3)ns), 7400 keV (2.1(5)ns), 6101 keV (41(2)ns), 5247 keV (5(2)ns), 3244 keV (3.9(8)ns), 2651 keV (9.6(4)ns). For ^{210}Rn: 8555 keV (2.6(3)ns), 4994 keV (19(1)ns), 1665 keV (15.0(15) ns). Some theoretical implications of these measurements for the structure of ^{211}Rn and ^{210}Rn are discussed.

30921 (ANU-P—931) G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn. Poletti, S.J.; Dracoulis, G.D.; Poletti, A.R.; Byrne, A.P.; Stuchbery, A.E.; Gerl, J. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Aug 1985. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701817.

The g-factors of isomeric states in ^{210}Rn have been measured using the TDPAD technique. Semi-empirical shell model calculations, with explicit inclusion of the couplings to the 3 octupole vibration, are carried out for the core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn. The resulting mixed multi-particle configurations are used to explain simultaneously the g-factors and enhanced E3 transitions which connect several pairs of these states.

30922 (ANU-P—933) Spectroscopy of high spin states in sup(211,212,213)Fr. Byrne, A.P.; Dracoulis, G.D.; Fahlander, C.; Hubel, H.; Poletti, A.R.; Stuchbery, A.E.; Gerl, J.; Davie, R.F.; Poletti, S.J. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Aug 1985. 88p. NTIS (US Sales Only), PC A05/MF A01. File Number DE86701818.

The level structures of ^{211}Fr, ^{212}Fr and ^{213}Fr have been observed to high spins, approx. $28(\hbar/2\pi)$ (and excitation energies approx. 8 MeV) using a variety of gamma-ray spectroscopic techniques. The structure of these nuclides is discussed in terms of couplings of single particle states through empirical shell model calculations. Good agreement with experiment is obtained. In ^{212}Fr and ^{213}Fr core-excited configurations are required to explain the properties of the highest states. A number of long lived states were observed in each nucleus some of which decay by by enhanced E3 transitions. The E3 transition strengths are discussed.

30923 Spin excitations in ^{208}Pb. Wambach, J.; Fiebig, R. (Department of Physics, State University of New York at Stony Brook, Stony Brook, NY). pp 475-494 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

The present paper considers various aspects of the response of ^{208}Pb to spin perturbations. The excitation of the Gamow-Teller and various transverse magnetic states are discussed, based on a boson exchange picture for the spin channel of the particle-hole interaction. The role of the tensor force in isoscalar spin states is investigated. The dynamics of the coupling of 1p-1h degrees of freedom to multiparticle-multihole channels is analyzed in a 2p-2h doorway state model. Energy weighted sum rules are derived for spin operators in the long wavelength limit based on the quark model.

6520 Nuclear Properties And Reactions, A=220 And Above, Theoretical

30924 (CEA-CONF—8033) Quasi-particle excitations in low energy fission. Ashgar, M.; Djebara, M.; Bocquet, J.P.; Brissot, R.; Maurel, M.; Nifenecker, H.; Ristori, C. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). May 1985. 4p. (CONF-850507—59). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751603.

From International conference on nuclear data for basic and applied science; Santa Fe, NM, USA (13 May 1985).

Proton odd-even effect for ^{230}Th(nsub(th),f) and ^{232}U(nsub(th),f) has been determined with a ΔE-Esub(R) gas telescope. These data indicate that the qp-particle excitation probability at the saddle point is small and most of its results, when the nucleus moves from saddle to scission and the neck ruptures into final fragments. These results are discussed in terms of the different ideas and models.

30925 (CEA-CONF—8034) Post-neutron mass distribution for ^{232}U(nsub(th),f). Haddad, M.; Asghar, M.; Crancon, J.; Hamelin, C.; Lhospice, G.; Blachot, J. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)). May 1985. 4p. (CONF-850507—58). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751602.

From International conference on nuclear data for basic and applied science; Santa Fe, NM, USA (13 May 1985).

The post-neutron absolute mass yields of 35 products from 25 mass chains for ^{232}U(nsub(th),f) have been determined by γ-ray spectroscopy. The resulting mass distribution for ^{232}U is compared with the corresponding existing data on ^{233}U and ^{235}U.

30926 (CEA-CONF—8037) Cold fragmentation in thermal neutron induced fission of ^{235}U. Trochon, J.; Simon, G.; Behrens, J.W.; Brisard, F. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)). May 1985. 5p. (CONF-850507—60). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751604.

From International conference on nuclear data for basic and applied science; Santa Fe, NM, USA (13 May 1985).

The fragmentations without neutron emission (cold fragmentations) have been investigated using a twin-axial gridded ionization chamber, for thermal neutron induced fission of ^{235}U. The kinetic energies of both fragments have been measured with high energy resolution (approximately 300 keV FWHM). Simultaneously, the fragment charges have been determined with a precision of Z/ΔZ=45. The results show, for a given charge split, no even-odd effect in mass yield. The division for a given mass fragmentation is mainly governed by the splitting which maximises the energy released.

30927 (CENBG—8502) Mass energy correlation measurement in ^{252}Cf spontaneous fission. Sicre, A.; Barreau, G.; Caitucoli, F.; Doan, T.P.; Leroux, B.; Martinez, G.; Asghar, M.; Benfoughal, T. (Bordeaux-1 Univ., 33 - Gradignan (France). Centre d'Etudes Nucleaires). 1985. 11p. (In French). (CONF-8502101—10). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751589.

From 8. biennial session on nuclear physics; Aussois, France (4 Feb 1985).

Fragment-mass and kinetic energy distribution measurements for ^{252}Cf(sf) have been extended to the far-out asymmetric low yield fission region up to Msub(H)=190 compared with the existing data that go up to Msub(H) approximately 168. The mass yield Y(M) shows an important enhancement for Msub(H)>=176. The <Esub(K)> (M), σEsub(K)(M) and, to a lesser extent, Y(M) distributions show strong and correlated amplitude fluctuations for Msub(H)>=170. These data indicate strong and rapid changes in deformation of the nascent fragments. These structures are discussed in terms of the static macro-microscopic potential energy calculations. Several spherical and deformed shells are involved to stabilize the light fragment and especially the proton spherical shell Z=28. So it is possible to observe very rich neutron nuclei like $_{28}$^{78}Ni. Furthermore we select small excitation energy events (E*=Qsub(R) - Esub(KT)<=8 MeV. The distribution Y(M) for these nearly cold fragmentations is dominated by the strong neutron deformed shell N=88 and shows an important charge odd-even effect.

30928 (INIS-BR—453) Excitation function and half-life for the fission isomer sup(240m) Pu from the ^{238}U(α, 2n) sup(240m) Pu reaction. Barros, S. de; Magalhaes, S.D. de; Wolf, H.; Barreto, J.; Eichler, J.P.F.; Lisbona, N.; Souza, I.O. de; Vianna, D.M. (Rio de Janeiro Univ. (Brazil). Inst. de Fisica). [1986]. 15p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701819.

The excitation function for the fission isomer sup(240m) Pu produced in the reaction of ^{238}U with α particles, has been measured at laboratory incident energies ranging from 20.1 to 27.3 MeV. A value of 3.8 sup(+0.6) sub(-0.4) nsec was obtained for the half-life of sup(240m) Pu. The results are compared with other measurements performed using different experimental methods.

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 30898, 30909

30929 (ANU-P—922) Heavy ion induced fusion/fission and barrier penetration. Lecture notes. Rhoades-Brown, M.J. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Sep 1985. 36p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701798.

Lectures given in the Department of Nuclear Physics, ANU, Canberra, November-December 1984.

The three lectures presented are: simultaneous description of quasi-elastic and fusion reactions in sub-barrier heavy ion scattering, coupling to inelastic channels and sub-barrier fusion - inclusion of the transfer channel.

30930 (DOE/ER/10434—6) Nuclear structure studies far from the line of beta stability. Avignone, F.T. III. (South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy). 15 Apr 1986. Contract AS09-79ER10434. 44p. NTIS, PC A03/MF A01; GPO Dep. File Number DE86009516.

This report includes research activities concerning nuclear structure research of neutron rich and neutron deficient isotopes. Individual sections deal with Coulomb interactions; lifetime measurements of nuclei; calculations and Monte Carlo simulations for predicting responses of Ge and NaI(Tl) detectors to gamma radiation; and beta decay, energy levels, and mass measurements of selected isotopes. The research program features the discovery of new isotopes via their delayed proton decay and the detailed investigation of the beta-delayed, proton spectra. This report covers activities through the contract period from 1979 through 1985. 10 refs. (DWL)

30931 (GANIL-P—85-06) Excitations in grazing heavy ion reactions. Dietrich, K.; Werner, K. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)). 1985. 23p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86751321.

We show that a model of independent particle-hole excitations in a two-centre basis is able to produce resonance like structures in cross sections of heavy ion reactions. A fit to the experimental data on the system ^{40}Ca on ^{40}Ca at 400 MeV beam energy yields a relative transfer probability close to one. It reproduces the data quite well at this energy. We show how the excitation of coherent states and the present model can be unified.

30932 (IC—85/45) Construction of local-scale transformed wave functions and its application to ATDHF. Petkov, I.Zh.; Stoitsov, M.V. (International Centre for Theoretical Physics, Trieste (Italy)). Apr 1985. 17p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701801.

An approach for the introduction of collective variables into a certain many-particle wave function is proposed. The crucial step is the performance of a local-scale point transformation, which naturally introduces the nuclear density characteristics as collective variables. It is established that the local-scale transformed wave functions satisfy the generalized scaling property. Using the continuity equation, a local-scale version of the ATDHF theory is given. Its application to isoscalar monopole vibrations in nuclei leads towards dynamically coupled vibrations of nuclear density. Further possible applications are briefly considered.

30933 (INS—517) Nuclear collision theory with many-body correlations, 1. Formulation. Kurihara, Yukio. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Nov 1984. 37p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701804.

A generalized many-body correlation operator is introduced, following Feshbach's formalism. Especially, the many-body correlation induced by the strong repulsion and attraction of the realistic NN interaction is considered and Feshbach's formalism is reformulated to describe such a many-body correlation well. A method to estimate the many-body correlation operator is given from the multiple-scattering picture. The present formalism is compared with the resonating-group method.

30934 (INS—518) Reflection of the classical age in the intermediate energy physics. Yamaguchi, Yoshio. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Nov 1984. 24p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701799.

Several episodes in the classical epoch (from mid-1930's to early 1950's) of intermediate energy physics (high energy physics at this era) shall be described.

30935 (INS—519) Unified theory of nuclear physics. Yamaguchi, Yoshio. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Nov 1984. 12p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701802.

A unified theory of low and medium energy nuclear physics is formulated on the basis of quasi-nucleons interacting with various sorts of Bose fields. An elementary theory of the EMC-effect is also presented.

30936 **(ISN—85-30) Towards temperature dependant nuclear forces for the description of hot nuclei.** Suraud, E.; Schuck, P. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires). May 1985. 1p. (CONF-8506262—1-Summ.). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751618.

From Summer school on theory of nuclear structure and reactions; La Rabida, Spain (23 Jun 1985).

Published in summary form only.

30937 **(LBL—21165) Microcanonical simulation of nuclear disassembly.** Koonin, S.E.; Randrup, J. (Lawrence Berkeley Lab., CA (USA); California Inst. of Tech., Pasadena (USA). W.K. Kellogg Radiation Lab.). Feb 1986. Contract AC03-76SF00098. 7p. (CONF-860270—8). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009356.

From 4. winter workshop on nuclear dynamics; Copper Mountain, CO, USA (24 Feb 1986).

A microcanonical simulation is formulated of the disassembly of a finite nuclear system into individually excitable and mutually interacting nuclear fragments. Illustrative results are presented. 7 refs.

30938 **Evidence for Δ-h components from pion reactions.** Morris, C.L. (Los Alamos National Laboratory, Los Alamos, NM). pp 161-172 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

The role of the excited baryon resonances (such as the Δ / sub 3,3/) in nuclear matter is an important problem which is not yet fully understood. In this paper, some anomalies observed in pion inelastic scattering are explained with a model which includes Δ /sub 3,3/ admixtures in low-lying nuclear states. Semi-quantitative analysis of these effects indicates the amplitudes for the Δ /sub 3,3/ admixtures necessary to explain these effects are on the order of a few percent. Although a more rigorous theoretical treatment of this problem is necessary, it appears that pion-induced reactions may provide a tool with which the spectroscopy of these Δ /sub 3,3/ admixtures can be studied.

30939 **Spin excitations in pion inelastic scattering.** Seestrom-Morris, S.J.; Cottingame, W.B.; Holtkamp, D.B. (Los Alamos National Laboratory, Los Alamos, NM). pp 291-309 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

This paper is a review of the data on spin excitations observed in pion inelastic scattering. A predominant feature of this process is the selectivity with which high-spin unnatural-parity states are excited. Constant-q excitation functions have proven valuable in identifying unnatural-parity states because of the unique signature of $\Delta S = 1$ transitions versus $\Delta S = 0$ transitions. It has been shown recently that angular distributions measured for transitions to natural-parity states can be quite different for $\Delta S = 0$ and $\Delta S = 1$ transitions. Thus, pion scattering should continue to prove useful in studying the spin structure of nuclear transitions because of the sensitivity of both excitation functions and angular distributions to the spin transfer to the nucleus. In particular, pion scattering measurements may be helpful in searches for spin-mode giant resonances.

30940 **Can we learn about the spin flip giant dipole resonances with pions?.** Baer, H.W. (Medium Energy Physics Division, Los Alamos National Laboratory, Los Alamos, NM). pp 523-538 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

This paper describes theoretical studies performed which have predicted the existence of large differences in the angular distribution shapes of $\Delta S = 1,1^-$ and $\Delta S = 0,1^-$ transitions. At forward angles these two angular distributions are nearly out of phase. The preliminary data on the $^{18}O(\pi,\pi')^{18}O(1^-,4.45\ MeV)$ angular distribution at 164 MeV and in the region 20°-60° has a shape which looks very much like the calculations for $\Delta S = 1,1^-$ states. For the study of spin flip components of the giant dipole resonance, the differences in angular distribution shapes between $\Delta S = 0,1^-$, $\Delta S = 1,1^-$ and $\Delta S = 1,2^-$ transitions offers a powerful method for separating these components experimentally. Data and calculations for the $^{40}Ca(\pi^+,\pi^0)$ reactions at 164 MeV are shown which also indicate that pion scattering possesses a unique signature identifying the 1^- and 2^- spin-isospin components of the giant dipole resonance.

30941 **Future possibilities for (n,p) studies at intermediate energies.** Brady, F.P.; Brown, V.R.; Castaneda, C.M.; Poppe, C.H.; Romero, J.L. (Physics Department, University of California, Davis, CA). pp 539-558 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

The study of giant resonances in nuclei via inelastic electron and hadron scattering is currently of great interest. The (n,p) excites only isovector transitions, and since $T_3 = 1^+$, this implies an additional selectivity for (n,p) over (p,n) in N>Z nuclei where only the T+1 analog states will be excited. This paper is an elaboration on the rationale for going to energies higher than 60 MeV in studies using the (n,p) reaction. Among the advantages described are the use of the variation in neutron excess to learn about the role of isospin in the 1kw and 2kw excitations. In addition, (n,p) is a good reaction to learn more about charge exchange with transition densities that do not peak at q=0. The tensor force is more important in 2kw excitations; the exchange and the odd force components may be studied at higher q. One of the hopes for the future is higher energy (n,p) facilities to study spin flip modes and reduce distortion factors.

30942 **Opening remarks: basic quark considerations.** Teller, E. (Lawrence Livermore Laboratory, University of California, Livermore, CA). pp 1-5 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

The Gamow-Teller transition has received renewed interest in light of the recent experiments using (p,n) and other reactions. In particular, there is the question of the missing Gamow-Teller strength. In this paper, the author shows the possibility that the additional strength goes into the transformation of a nucleon into a delta particle. A simple quark model is given that qualitatively shows how the process occurs. The admixture of states caused by the application of the σ/tau/ operator will change the magnetic moments resulting in the presence of pions (with a small probability) and corresponding changed states of neutron, proton and Δ. The admixture of delta states might be a factor of importance, but the explanation of μ of -2.12 for ^3He will remain difficult.

30943 **Spin observables in nucleon-nucleus scattering.** Moss, J.M. (Los Alamos National Laboratory, Los Alamos, NM). pp 355-369 of Spin excitations in nuclei. Petrovich, F.; Brown, G.E. New York, NY; Plenum Press (1984). (CONF-820357—).

From International conference on spin excitations in nuclei; Telluride, CO, USA (25 Mar 1982).

The major problem of inelastic nucleon scattering and charge exchange has always been the enormous complexity of the nucleon-nucleon interaction. This very complexity may prove to be the ultimate promise of nucleons as probes of nuclear structure. It is now feasible to perform complete polarization transfer experiments for inelastic proton scattering with high efficiency and excellent energy resolution. In this paper are presented the procedures of polarimetry with protons in the energy range of 100 MeV, the physics which may be obtained, and the role of these experiments in

present and future research. Expressions are derived from a plane-wave impulse approximation which describe the observables in the excitation of unnatural parity states and natural parity transitions and which evaluate the polarization and analyzing power of polarization transfer. Experiments are discussed which cover spin excitation, spin observables and reaction mechanisms, spin observables and meson exchange, experiments for discrete states and longitudinal and transverse response functions.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 31091

30944 **(AREAEE—279) Asymptotic time dependent neutron transport in multidimensional systems.** Nagy, M.E.; Sawan, M.E.; Wassef, W.A.; El-Gueraly, L.A. (Nuclear Research Centre, Inshas (Egypt)). 1983. 32p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86701796.

A model which predicts the asymptotic time behavior of the neutron distribution in multi-dimensional systems is presented. The model is based on the kernel factorization method used for stationary neutron transport in a rectangular parallelepiped. The accuracy of diffusion theory in predicting the asymptotic time dependence is assessed. The use of neutron pulse experiments for predicting the diffusion parameters is also investigated.

30945 **(CEA-CONF—7954) Using last event estimator for detection calculations.** Daronian, P.; Verwaerde, D. (CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)). Apr 1985. 17p. (CONF-8504110—22). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751591.

From Joint Los Alamos/CEA meeting on Monte Carlo methods; Cadarache, France (22 Apr 1985).

Frequently, the Boltzmann equation has to be solved to obtain responses of a large number of detectors to a neutron flux. It is the case for neutrography and also for simulating a nuclear physics experiment for neutron cross section measurement. A Monte-Carlo method, with a last event estimator seems to be a very suitable one to solve this class of problems. In this paper, the bases of the method are first briefly described and then two main applications are given: a numerical simulation of beryllium cross-section measurement and a neutrography calculation.

30946 **(CONF-860610—3) Nucleon-meson cascade calculations by Monte Carlo methods.** Alsmiller, R.G. Jr.; Alsmiller, F.S.; Gabriel, T.A.; Hermann, O.W. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 7p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86005024.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

A brief review is given of Monte Carlo calculations of data concerning the nucleon-meson cascades that develop when high-energy nucleons and mesons pass through matter. The codes discussed cover cascades for incident particles of energies from about 3 GeV up to hundreds of GeV. Some results obtained using different codes are compared. 22 refs., 2 figs. (LEW)

30947 **(DOE/ER/40157—3) Tests of T-invariance with slow neutrons.** Kabir, P.K. (Virginia Univ., Charlottesville (USA). Beams Physics Lab.). 1985. Contract FG05-84ER40157. 5p. (CONF-8511137—5). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009672.

From Workshop on the investigation of fundamental interactions with cold neutrons; Gaithersburg, MD, USA (14 Nov 1985).

The polarization of neutrons propagating through a medium with spin-polarization S-vector may undergo precession about and towards [k-vector x S-vector]. Either effect is an unambiguous indicator of T-noninvariance. For $S \geq 1$, a similar effect, requiring target spin-alignment only, occurs if there are suitable T-noninvariant interactions even if these conserve parity exactly. 9 refs.

30948 **(LA-UR—85-3347) Diffusion approximation for modeling of 3-D radiation distributions.** Zardecki, A.; Gerstl, S.A.W.; De Kinder, R.E. Jr. (Los Alamos National Lab., NM (USA)). 1985. Contract W-7405-ENG-36. 10p. (CONF-8506217—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86000810.

From CRDC conference; Aberdeen, MD, USA (17 Jun 1985).

A three-dimensional transport code DIF3D, based on the diffusion approximation, is used to model the spatial distribution of radiation energy arising from volumetric isotropic sources. Future work will be concerned with the determination of irradiances and modeling of realistic scenarios, relevant to the battlefield conditions. 8 refs., 4 figs.

30949 **(RAL—85-080) Collective motions in dense fluids observed in neutron scattering.** Lovesey, S.W. (Rutherford Appleton Lab., Chilton (UK)). Sep 1985. 5p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701797.

A few topics of current interest in the study of collective motions in dense liquids and gases, in neutron scattering, are briefly reviewed.

30950 **Parallel S /sub n/ iteration schemes.** Wienke, B.R.; Hiromoto, R.E. (Los Alamos National Laboratory, Computing and Communications Division, Los Alamos, NM). *Nuclear Science and Engineering;* 90: No. 1, 116-123(May 1985).

The iterative, multigroup, discrete ordinates S /sub n/ representation for the linear transport equation enjoys widespread computational use and popularity. Serial iteration schemes and numerical algorithms developed over the years provide a timely framework for parallel extension. On the Denelcor heterogeneous element processor, three parallel iteration schemes (two chaotic, one ordered) are investigated for solving the one-dimensional S /sub n/ transport equation.

6550 Medical Physics

REFER ALSO TO CITATION(S) 30440, 30891, 30891

30951 **(UCRL—93776) Tissue-equivalent torso phantom for calibration of transuranic-nuclide counting facilities.** Griffith, R.V.; Anderson, A.L.; Dean, P.N.; Fisher, J.C.; Sundbeck, C.W. (Lawrence Livermore National Lab., CA (USA)). 16 Jan 1986. Contract W-7405-ENG-48. 23p. (CONF-860146—8). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009693.

From Radiobioassay and internal dosimetry workshop; Albuquerque, NM, USA (20 Jan 1986).

Several tissue-equivalent human-torso phantoms have been constructed for the calibration of counting systems used for in-vivo measurement of transuranic radionuclides. The phantoms contain a simulated human rib cage (in some cases, real bone) and removable model organs, and they include tissue-equivalent chest plates that can be placed over the torso to simulate people with a wide range of statures. The organs included are the lungs, liver, and tracheobronchial lymph nodes. Polyurethane with varying concentrations of added calcium was used to simulate the linear photon-attenuation properties of various human tissues, including lean muscle, adipose-muscle mixtures, cartilage, and bone. Foamed polyurethane was used to simulate lung tissue. Organs have been loaded with highly pure ^{238}Pu, ^{239}Pu, ^{241}Am, and other radionuclides of interest. The validity of the phantom as a calibration standard has been checked in separate intercomparison studies using human subjects whose lungs contained a plutonium simulant. The resulting phantom calibration factors generally compared to within +-20% of the average calibration factors obtained for the human subjects.

6560 Solid-state Physics

REFER ALSO TO CITATION(S) 30156, 30166

30952 (BNL—37962) Crystallography of icosahedral crystals. Bak, P. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 8p. (CONF-8603112—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009945.

From Winter school on aperiodic crystals; Les Houches, France (11 Mar 1986).

The crystallography of icosahedral crystals is constructed. The actual three-dimensional crystal is represented by a three-dimensional cut in a regular six-dimensional periodic crystal with symmetry described by a six-dimensional space group, and the positions of atoms correspond to an arrangement of hypersurface segments. The resulting crystal cannot in general be viewed as a space-filling arrangemment of a small number of different "Penrose tiles." The intensities of Bragg spots are given directly as the intensities of Bragg spots of the six-dimensional crystal. 16 refs., 2 figs.

30953 Phenomena involving magnetic moment suppression. Maple, M.B. (Department of Physics and Institute for Pure and Applied Physical Sciences, University of California, San Diego, La Jolla, CA). pp 1-24 of Moment formation in solids. Buyers, W.J.L. New York, NY; Plenum Press (1984). (CONF-8308132—).

From NATO/CAP institute on moment formation in solids; Vancouver Island, Canada (21 Aug 1983).

The following is an abbreviated account of a series of three lectures that were given by the author at the NATO/CAP Advanced Study Institute on Moment Formation in Solids. Various phenomena that are associated with magnetic moment suppression in rare earth and actinide systems were reviewed in these lectures, the first two of which were primarily (but not exclusively) devoted to concentrated systems such as α-Ce, "gold" SmS, and UIn_3B_2, and the last of which focused on dilute systems such as (LaCe)Al_3, (LaSm)Sn_3 and ThU. Magnetic moments in rare earth (RE) and actinide (A) systems are derived from partially-filled 4f and 5f electron shells of the RE and A ions, and their degree of suppression (or development, depending on one's viewpoint) spans a continuum between well-defined (Curie-like magnetic susceptibility) and nonexistent (Pauli-like magnetic susceptibility). Any degree of magnetic moment suppression may be found in a given rare earth or actinide substance under ambient conditions, or it may often be induced by the application of an external pressure or by alloying with another element.

6561 Superconductivity

30954 Theory of elementary excitations in intermediate valence materials. Fedro, A.J.; Sinha, S.K. (Materials Science and Technology Division, Argonne National Laboratory, Argonne, IL). pp 135-151 of Moment formation in solids. Buyers, W.J.L. New York, NY; Plenum Press (1984). (CONF-8308132—).

From NATO/CAP institute on moment formation in solids; Vancouver Island, Canada (21 Aug 1983).

We review the formalism for calculating the properties of systems represented by an Anderson lattice Hamiltonian. First, a mean-field theory for the one electron Green's function is presented and then extended to include spin and charge fluctuations which lead to a many-body resonance near the Fermi level. The dynamical spin susceptibility and neutron scattering cross section are also evaluated. Finally, we present a calculation which indicates the possibility of a Cooper-pairing mechanism induced by electron correlations.

6570 Theoretical Physics

REFER ALSO TO CITATION(S) 29990, 30768, 30768, 30769, 30807, 31286, 31288

30955 (BNL—37891) Spectral and parameter estimation problems arising in the metrology of high performance mirror surfaces. Church, E.L.; Takacs, P.Z. (Army Armament Research and Development Command, Dover, NJ (USA); Brookhaven National Lab., Upton, NY (USA)). Apr 1986. Contract AC02-76CH00016. 4p. (CONF-860475—2). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009914.

From International conference on acoustics, speech and signal processing; Tokyo, Japan (7 Apr 1986).

The accurate characterization of mirror surfaces requires the estimation of two-dimensional distribution functions and power spectra from trend-contaminated profile measurements. The rationale behind this, and our measurement and processing procedures, are described. The distinction between profile and area spectra is indicated, and since measurements often suggest inverse-power-law forms, a discussion of classical and fractal models of processes leading to these forms is included. 9 refs.

30956 (CEA-CONF—8028) Skyrmions. Blaizot, J.P. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)). Mar 1985. 13p. (CONF-850375—21; SPh-T—85-085). NTIS (US Sales Only), PC A02/MF A01. File Number DE86751365.

From 20. Recontre de Moriond; Les Arcs, France (10 Mar 1985).

This review is an introduction to the physics of the Skyrmion. The Skyrme model is described with emphasis on its most important qualitative aspects. The interpretation of Skyrme model as an effective theory related to QCD is discussed. The semi-classical quantization of the Skyrmion is presented and justification is given for the interpretation of the winding number as the baryon number. It is show that chiral Lagrangian may provide a unifying framework for baryon and meson phenomenologies.

30957 (IC—84/232) Canonical ensemble redefined - 2: Magnetic systems. Venkataraman, R. (International Centre for Theoretical Physics, Trieste (Italy)). Dec 1984. 6p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86701711.

The mean field theory and the 1-D Ising model for magnetic systems are solved in the redefined ensemble formalism. In the mean field theory spontaneous magnetization is governed by the relation αprimesub(I)+2β=1 where αprimesub(I) is the input value of the critical exponent for the specific heat. 1-D Ising does not show any spontaneous magnetization even in microcanonical ensemble calculation.

30958 (LA-UR—85-3264) Foundations of statistical crack mechanics. Dienes, J.K. (Los Alamos National Lab., NM (USA)). 1986. Contract W-7405-ENG-36. 7p. (CONF-860616—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86000764.

From International symposium on intense dynamic loading and its effects; Beijing, China (3 Jun 1986).

The principle of superposition of elastic and plactic strain rates in regions of plastic flow was hypothesized by Reuss in order to provide a smooth transition of the stresses between regions of elastic and elastic-plastic deformation. In this paper a generalization of this hypothesis is derived which allows for the formulation of more complex constitutive laws that can account for simultaneous plastic flow, fracture, fragmentation, and changes in porosity. Such processes can occur during impact, explosions and earthquakes. The possibility of analyzing such processes by finite element methods has been made possible by the advent of large scale computers, but most practioners agree that more general constitutive laws are required to account adequately for the complex flow processes involved.

30959 **(UCRL—92562-Rev.1) Comparison of Clifford and Grassmann algebras in applications to electromagnetics. Revision 1.** Deschamps, G.A.; Ziolkowski, R.W. (Illinois Univ., Urbana (USA). Dept. of Electrical and Computer Engineering; Lawrence Livermore National Lab., CA (USA)). Feb 1986. Contract W-7405-ENG-48. 17p. (CONF-8509246—1-Rev.1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009716.

From Advanced research workshop: Clifford algebras and their applications to mathematical physics; Canterbury, England (15 Sep 1985).

Grassmann and Clifford algebras are compared as to their applications to electromagnetics. The Grassmann algebra applies directly to (exterior) differential forms leading to Cartan's calculus. Forms of various degrees correspond most naturally to electromagnetic quantities and their relations are expressed by means of the exterior differential operator d. These relations are conveniently represented either in space or space-time by flow diagrams. They reveal the existence of potentials (Poincare's Lemma), the independence from coordinate systems, and the role of the metric. All of these properties are briefly reviewed. A calculus for functions having their values in a Clifford algebra can also be developed based on the Dirac operator D, whose square is a generalized Laplacian. Besides its role in Dirac's theory of the electron, this Clifford calculus can also be adapted to electromagnetics, although less directly than with Cartan's calculus. The point of departure is the role of a metric in a Clifford algebra. This can be remedied by introducing the Hodge star operator in the Grassmann algebra, an operation that is needed to express the property of matter usually represented by means of ϵ and μ. 10 refs., 5 tabs.

6580 Mathematical Physics

REFER ALSO TO CITATION(S) 30950, 30958, 30959

30960 **(BNL—37846) Zero models and pole models for multivariable systems.** Zhang, S.Y. (Brookhaven National Lab., Upton, NY (USA)). 1986. Contract AC02-76CH00016. 5p. (CONF-860638—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009442.

From American control conference; Seattle, WA, USA (18 Jun 1986).

In this paper, the concepts of zero models and pole models are introduced for the multivariable systems. The definitions are different from the existing definitions of poles and zeros for multivariable systems they reflect more structural informations for the systems, and can be used to study the external properties of the systems. The pole models and zero models in the closed-loops are also discussed. It will be shown that the zero models of the closed loop systems play a key role in the tracking and rejection problem. 15 refs., 5 figs.

30961 **(SOL—86-3) Constructive characterization of Q_0-matrices with nonnegative principal minors.** Aganagic, M.; Cottle, R.W. (Stanford Univ., CA (USA). Systems Optimization Lab.). Jan 1986. Contract AS03-76ER72018. 13p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009867.

The class of matrices with nonnegative principal minors for which the linear complementarity problem always has a solution is characterized. The main result gives a finitely testable set of necessary and sufficient conditions under which a matrix with nonnegative principal minors has the property that if a corresponding linear complementarity problem is feasible then it is solvable. 15 refs.

70 FUSION ENERGY

REFER ALSO TO CITATION(S) 30762

7001 Plasma Research

REFER ALSO TO CITATION(S) 31167, 31188, 31209, 31220, 31262, 31263, 31264

30962 **(DOE/ER/53134—T1) Complex geometric optics theory in an inhomogeneous plasma. Appendix B.** Bravo-Ortega, A.; Glasser, A.H. (Auburn Univ., AL (USA). Dept. of Physics). 1984. Contract AS05-82ER53134. 6p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009884.

The geometric optics theory is applied to an inhomogeneous plasma in which the dielectric tensor is not necessarily Hermitian. A complex dispersion relation for a non-degenerate plasma is obtained as well as complex ray tracing and amplitude equations. From the amplitude equation is possible to identify and separate the focusing effects according to their effects on the plasma e.g., those ones due to cutoffs and resonances.

30963 **(DOE/ER/53134—T2) Mode conversion of lower hybrid waves at high ion cyclotron harmonics. Appendix F.** Swanson, D.G.; Cho, S. (Auburn Univ., AL (USA). Dept. of Physics). May 1985. Contract AS05-82ER53134. 5p. NTIS, PC A02. File Number DE86009885.

The problem of ion cyclotron harmonic absorption for a lower hybrid wave is shown to be a mode conversion problem. A new form of the dispersion relation is developed and then expanded to get a differential equation identical to that for the second harmonic problem. The validity of this model is restricted to the region far from the lower hybrid resonance layer. It is shown that mode couplings occur among the incident cold wave and two other waves, and the tunneling factor becomes singular there.

30964 **(DOE/ER/53140—24) ICRF wave propagation and absorption in axisymmetric mirrors. Annual report, July 1, 1985-February 28, 1986.** Todd, A.M.M.; Phillips, M.W. (Grumman Aerospace Corp., Bethpage, NY (USA)). Apr 1986. Contract AC02-82ER53140. 9p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010234.

A numerical code called GARFIELD has been developed to calculate the structure of ICRF electric fields in axisymmetric mirrors. It is being used to investigate ICRF wave structure of central cells of tandem mirror experiments. Fields are solved on a 2-D grid in the axial and radial directions. This permits us to study the effect that axial as well as radial variations of the magnetic field and density have on ICRF wave propagation and absorption. Much of this time frame was spent writing the code and refining the numerics. Initial calculations have been completed for the Phaedrus tandem mirror. These show that there is an evanescent fast wave structure in the radial direction, a standing wave formation in the axial direction, and a small amount of propagating ion cyclotron wave towards a shallow magnetic beach in the center of the mirror. In general, the fields peak on the outside which would show that the resulting pondermotive force would tend to stabilize the plasma.

30965 **(DOE/ER/53206—T1) Theoretical studies of the heating of toroidal plasmas with radiofrequency electromagnetic radiation. Progress report, July 1, 1985-June 30, 1986.** Swanson, D.G.; Wersinger, J.M.; Hanson, J.D. (Auburn Univ., AL (USA). Dept. of Physics). Apr 1986. Contract FG05-85ER53206. 37p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009804.

Progress is reported in several areas of interest to rf heating of plasmas. (1) The continuing improvement of the ray-tracing code includes improved speed and accuracy. The development of a complex ray-tracing code is largely implemented. This allows the following of rays through regions where normal ray-tracing methods fail. (2) A major contribution is in the area of parametric instabilities, and a way to minimize their effect on the lower hybrid waves. By following a bundle of rays and evaluating the growth rate for

the most rapidly growing waves at each point, the daughter waves have been followed to the point where pump depletion begins to be important. (3) The continuing study of mode conversion problems has taken several directions. It has been shown that ion absorption of lower hybrid rays frequently involves cases where three types of waves are coupled through linear mode conversion in the same region of space, namely the cold lower hybrid wave, the warm lower hybrid wave, and an ion Bernstein mode. This three wave coupling problem is analyzed analytically in terms of a sixth order wave equation which describes coupling between all branches, but the analytical model may not adequately represent the physical problem. Numerical methods have been compared in terms of accuracy, and the comparisons show some touted methods to be useful only in very restricted ranges of parameter space. Finally, a method of reducing the order of the differential equations in mode conversion problems is described which is exact.

30966 **(EUR-CEA-FC—1264) Identification of highly-ionized xenon spectra (Xe XXVI through Xe XXXI) excited in the plasma of the TFR Tokamak.** Wyart, J.F.; Bauche-Arnoult, C.; Luc-Koenig, E. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee). May 1985. 20p. NTIS (US Sales Only), PC A02/MF A01. File Number DE86751586.

The spectrum of xenon injected into the TFR tokamak plasma has been recorded in the range 10-90 A by means of a 2m grazing incidence spectrograph. Forty-four lines and unresolved transition arrays pertaining to multicharged xenon ions isoelectronic with Cu I, Ni I, Co I, Fe I, Mn I and Cr I have been identified by means of various theoretical methods. The 17 observed lines of the $3p^6 3d^8$ - $3p^5 3d^9$ transition array, have allowed the wavelengths of the magnetic dipole transitions occuring within the ground configuration $3d^8$ of Xe XXXIX to be predicted.

30967 **(EUR-CEA-FC—1265) Theoretical and experimental study of modes associated to ion cyclotron heating on TFR.** Pignol, L. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee; Paris-7 Univ., 75 (France)). May 1985. 160p. (In French). NTIS (US Sales Only), PC A08/MF A01. File Number DE86751594.

In this work, the ion cyclotron wave evolution is followed thanks to a coherent scattering device using carbon dioxide laser radiation. A theoretical part presents the dispersion equation that obey the waves excited in the plasma by antenna emitting ion cyclotron frequency. Then measurements given by the diagnostic are given. Fast and slow waves evidenced theoretically, are experimentally observed. Two simple theoretical models allow to extract physical quantities characteristics of the two modes. These two modes are followed along the radial coordinate of the tore and their behavior through the hybrid curve is studied. measured spectra shape is shown to confirm the described numerical code validity. Time study of the slow wave shows of internal relaxation phenomenon of plasma.

30968 **(FRNC-TH—2164) Automatic measurement of characteristic quantities of nuclear plasma.** Stathopoulos, D. (Paris-11 Univ., 91 - Orsay (France)). Nov 1983. 108p. (In French). NTIS (US Sales Only), PC A06/MF A01. File Number DE86751593.

The work presented here is part of researches on simulation on plasma produced by nuclear radiations, so as to understand nuclear pumping laser operation. This thesis is more peculiarly aimed at studying the effect on plasma of an electromagnetic pulse of heating, using computing means to automatized the heating device and acquire data. Measurements have been made in neon and nitrogen mixture and have been extended to neon-nitrogen-oxygen mixture. A diagnostic method allows to know ionization effiency of the beam, together with laws, related to temperature, of recombination coefficients of created ions. As an example, the oxygen introduction in the mixture allowed to get the first results on this gas.

30969 **(GA-A—18380) Comparison of experimentally-inferred ion thermal diffusivities with neoclassical theory for neutral beam-heated discharges in the Doublet III tokamak.** Groebner, R.J. (GA Technologies, Inc., San Diego, CA (USA)). Apr 1986. Contract AC03-84ER51044. 7p. (CONF-860412—7). NTIS, PC A02/MF A01; GPO Dep. File Number DE86010223.

From 13. European conference on controlled fusion and plasma heating; Schliersee, F.R. Germany (14 Apr 1986).

The study of ion transport in neutral beam-heated discharges in tokamaks is necessary to determine if neoclassical theory can reliably be used to predict the performance of future machines. Previous studies of ion tranport have generally been difficult due to the lack of information regarding the ion temperature profile. The standard procedure used to study ion transport has been to model the T/sub i/ profile with the assumption that the ion thermal diffusivity profile chi/sub i/(r) was equal to a multiplier times chi/sub i//sup neo/(r), the ion thermal diffusivity calculated from neoclassical theory. The multiplier was varied until the calculated T/sub i/ profile agreed with the available ion temperature data, usually T/sub i/(0) or the measured neutron rate. Values of the multiplier in the range of 1 to 10 have generally been obtained with few estimates of the uncertainties in these values. Furthermore, there have been few, if any, attempts to calculate chi/sub i/ by modeling the ion temperature profiles in other ways. As a result, the issue as to whether or not the ion transport in tokamaks is in agreement with neoclassical theory has not been definitively answered.

30970 **(GA-A—18412) Finite-beta global MHD stabilities for circular and highly-elongated tokamaks with and without poloidal divertors.** Lee, J.K. (GA Technologies, Inc., San Diego, CA (USA)). May 1986. Contract AC03-84ER53158. 6p. (CONF-860515—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86010278.

From EPS conference on computational physics - computing in plasma physics; Partenkirchen, F.R. Germany (13 May 1986).

A new initial value code is used in calculating the global MHD stabiliies for several highly elongated tokamak equilibria with magnetic separatrices as well as for circular equilibria near the beta limit.

30971 **(GA-A—18414) Plasma density and poloidal field measurements on text using an injected lithium beam.** West, W.P. (GA Technologies, Inc., San Diego, CA (USA)). Mar 1986. Contract AC03-84ER53158. 24p. (CONF-860324—26). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010210.

From High temperature plasma diagnostics; Hilton Head Island, SC, USA (9 Mar 1986).

Spectroscopy of an injected Li beam has been used to determine both the plasma density profile and the poloidal field profile on the TEXT tokamak. The neutral Li beam is injected at energies up to 95 keV and both collisional and laser-induced fluorescence are observed during a tokamak shot. Radial and temporal profiles are obtained during a complete shot. The applicability of this technique to larger tokamaks depends on several parameters including (but not limited to) beam penetration, reliability, spatial/temporal resolution, and signal-to-noise ratio. Because this basic technique obtains local measurements, it is also applicable to nonsymmetric devices. Such applications will be discussed.

30972 **(GA-A—18415) Cw dye laser system for Li beam spectroscopy in a tokamak.** West, W.P.; Thomas, D.M. (GA Technologies, Inc., San Diego, CA (USA)). Mar 1986. Contract AC03-84ER53158. 17p. (CONF-860324—24). NTIS, PC A02/MF A01; GPO Dep. File Number DE86010217.

From High temperature plasma diagnostics; Hilton Head Island, SC, USA (9 Mar 1986).

The current density profile diagnostic system developed for the TEXT tokamak employs a cw dye laser system to induce fluorescence in a Li beam injected into a tokamak. This laser spectral and polarization modulation requirements not available in commerical systems. The required spectrum is a bandwidth of approximately 5 GHz at a wavelength of 667 nm. The intensity within the bandwidth should be as uniform as possible, i.e., a quasi-continuum within the 5 GHz bandwidth. The polarization of the laser must

remain linear, but the plane of polarization must be rotated at a high frequency, 50 kHz. The details of the Li atomic spectrosocpy in a tokamak and the requirements of the diagnostic system that lead to these desired laser parameters will be addressed. The laser system and polarization modulator which have been developed will be discussed in detail, including both design and performance parameters. Possible improvements to enhance performance will also be addressed.

30973 **(Juel—2016) Real-time evaluation of electron and current density profile parameters on TEXTOR.** Bruessau, W.D.; Soltwisch, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Plasmaphysik). Aug 1985. 31p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86751635.

The shapes of electron and current density profiles are monitored in real-time mode in order to get rapid qualitative information on the development of a TEXTOR tokamak plasma. The profiles are described by form parameters which relate to the signals of a 9-channel FIR-polari/interferometer in simple mathematical formulae. These profile parameters are obtained by real-time conversion of measured quantities for display on a storage oscilloscope or on a chart recorder. The application of the parameters is demonstrated in some examples.

30974 (KEK—83-21, pp 101-108) **Application of polarized ions to fusion reactors.** Hasuyama, Hiroki; Wakuta, Yoshihisa. (Kyushu Univ., Fukuoka, Japan. Faculty of Engineering). Jan 1984. NTIS (US Sales Only), PC A06/MF A01. File Number DE86780444. (CONF-8303216—).

From Symposium on ion sources in accelerators; Oho, Ibaraki, Japan (15 Mar 1983).

It has been shown in a hot plasma of a magnetic fusion reactor that it would be possible to maintain the polarized nuclear spins for a certain confinement time. Some advantages of the fusion reactor using polarized nuclei are also described. The depolarization rates of the nuclear spin in the plasma have been estimated by considering several mechanisms for the spin flip in a strong-field fusion reactor.

30975 **(LA—10627-MS) Numerics for the simulation of electromagnetic-field propagation in nonionized and plasma media.** Borovsky, J.E. (Los Alamos National Lab., NM (USA)). Mar 1986. Contract W-7405-ENG-36. 19p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009798.

The numerical techniques used to simulate the propagation of low-frequency electromagnetic disturbances in Ohmic media and in collisional and collisionless plasmas are discussed. The scheme is based upon a multimedia propagation equation that is derived from Maxwell's equations. 10 refs., 5 figs.

30976 **(LP—199) S3T working group. Report 1: group aims.** Pouey, M. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique des Plasmas). Apr 1983. 45p. (In French). NTIS (US Sales Only), PC A03/MF A01. File Number DE86751588.

The work group S3T which is aimed to designing and developing devices using unconventional holographic optics is presented. These devices find applications that are classified here in four items high resolution spectrometers, high definition imaging, high flux devices, metrology and interferometry. The problems to solve and the aims of the group in each of these cases are presented. Three synthesis of lectures are in this report. The main one concerns stigmatism conditions of concave holographic gratings used in normal incidence. This new process of focusing is very interesting for hot plasma diagnostics.

30977 **(LP—201) Electron energy distributions and excitation rates in high-frequency argon discharges.** Ferreira, C.M.; Loureiro, J. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique des Plasmas). Jun 1983. 27p. NTIS (US Sales Only), PC A03/MF A01. File Number DE86751587.

The electron energy distribution functions and rate coefficients for excitation and ionisation in argon under the action of an uniform high-frequency electric field were calculated by numerically solving the homogeneous Boltzmann equation. Analytic calculations in the limiting cases $\omega >> \nu/\text{sub c}/$ and $\omega << \nu/\text{sub c}/$, where ω is the wave angular frequency and $\nu/\text{sub c}/$ is the electron-neutral collision frequency for momentum transfer, are also presented and shown to be in very good agreement with the numerical computations. The results reported here are relevant for the modelling of high-frequency discharges in argon and, in particular, for improving recent theoretical descriptions of a plasma column sustained by surface microwaves. The properties of surface wave produced plasmas make them interesting as possible substitutes for other more conventional plasma sources for such important applications as plasma chemistry laser excitation, plasma etching spectroscopic sources etc.

30978 **(PPPL—2268) Method for determining fast-alpha-particle confinement in tokamak plasmas using resonant nuclear reactors.** Cecil, F.E.; Zweben, S.J.; Medley, S.S. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Mar 1986. Contract AC02-76CH03073. 25p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009757.

The resonant nuclear reactions $D(\alpha,\gamma)^6Li$, $^6Li(\alpha,\gamma)^{10}B$, and $^7Li(\alpha,\gamma)^{11}B$ are examined as diagnostics of fast-alpha-particle confinement in tokamak plasmas. Gamma rays from these resonant reactions with energies from 2.1 MeV to 9.2 MeV may be used to infer the alpha-particle population between energies of 0.4 MeV and 2.6 MeV. The ratio of these alpha-burnup reactions to the reactions $T(D,\gamma)^5He$ and $^3He(D,\gamma)^5Li$ provides a technique for the measurement of alpha confinement.

30979 **(PPPL—2272) Numerical modeling of lower hybrid heating and current drive.** Valeo, E.J.; Eder, D.C. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Mar 1986. Contract AC02-76CH03073. 28p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009750.

The generation of currents in toroidal plasma by application of waves in the lower hybrid frequency range involves the interplay of several physical phenomena which include: wave propagation in toroidal geometry, absorption via wave-particle resonances, the quasilinear generation of strongly nonequilibrium electron and ion distribution functions, and the self-consistent evolution of the current density in such a nonequilibrium plasma. We describe a code, LHMOD, which we have developed to treat these aspects of current drive and heating in tokamaks. We present results obtained by applying the code to a computation of current ramp-up and to an investigation of the possible importance of minority hydrogen absorption in a deuterium plasma as the "density limit" to current drive is approached.

30980 **(PPPL—2284) Characterization of the TFTR plasma edge by Langmuir-calorimeter probes.** Kilpatrick, S.J.; Manos, D.M.; Budny, R.V.; Stangeby, P.C.; Ritter, R.S.; Young, K.M. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Mar 1986. Contract AC02-76CH03073. 21p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009758.

Two combination Langmuir-calorimeter probes were operated on the TFTR midplane to measure plasma properties of the scrape-off layer. Two different caloriemter elements were used: 0.5 x 3 x 8 mm Ta plates or 6.4 mm diameter graphite rods fitted with thermocouples. Separate graphite rods served as Langmuir elements. This paper presents Langmuir probe measurements of the radial profiles of edge density and electron temperature, and calorimeter measurements of heat flux. The variation of these quantities in certain operational regimes are presented, including dependence on ohmic and neutral beam heating, compression and free expansion, plasma major and minor radii, plasma current, and line integral density with and without Cr gettering.

30981 **(PPPL—2314) Pressure limits of an axisymmetric torus.** Yoshikawa, S. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Mar 1986. Contract AC02-76CH03073. 13p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009753.

In order to clarify the pressure limit of a toroidal plasma equilibrium in a three-dimensional geometry, an azimuthally symmetric toroidal plasma was considered. In a tokamak-like plasma, the net toroidal current is necessary for a finite β plasma equilibri-

um. If external conductors are used to provide the rotational transform, iota, the plasma pressure is limited to $\beta = (\text{iota}/2\pi)^2/2A$, where A is the aspect ratio.

30982 **(SAND—86-0283) Estimates of maximum trappable ion beam power in plasma channels.** Watrous, J.J.; Olson, R.E. (Wisconsin Univ., Madison (USA). Fusion Technology Inst.; Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 6p. (CONF-860652—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86006472.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Conservation laws and solutions to the equations of motion for single particles have been used to obtained greatest lower bounds on the ion beam power that can be injected into and confined within plasma channels. These bounds are use in the evaluation of proposed light ion driven ICF experiments and reactor concepts. Simple estimates of trappable power based on conservation laws will be compared with estimates based on solutions to the equation of motion. Consequences of the results of these calculations to current design studies will be discussed.

30983 **(UCID—20732) Ion diffusion at interfaces in hot plasmas.** Boercker, D.B.; Warren, K.; Haggin, G. (Lawrence Livermore National Lab., CA (USA)). Apr 1986. Contract W-7405-ENG-48. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009935.

There are many laboratory applications in which it is important to know how fast two hot, ionized materials mix across an initially sharp interface. The speed of this process is regulated by the interdiffusion coefficient for the species involved. In a previous work, a theoretical method for calculating the interdiffusion coefficient in a Binary Ionic Mixture (classical ions in a uniform, neutralizing background) was described and found to give excellent agreement with Molecular Dynamics estimates. The purpose of this report is to show how these results may be applied to a model of the plasma interface, including electric field effects, to give a good description of the mixing across it.

30984 **(UCRL—93878-Rev.1) Database tools for enhanced analysis of TMX-U data. Revision 1.** Stewart, M.E.; Carter, M.R.; Casper, T.A.; Meyer, W.H.; Perkins, D.E.; Whitney, D.M. (Lawrence Livermore National Lab., CA (USA)). 6 Mar 1986. Contract W-7405-ENG-48. 13p. (CONF-860324—3-Rev.1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009894.

From High temperature plasma diagnostics; Hilton Head Island, SC, USA (9 Mar 1986).

A commercial database software package has been used to create several databases and tools that assist and enhance the ability of experimental physicists to analyze data from the Tandem Mirror Experiment-Upgrade (TMX-U) experiment. This software runs on a DEC-20 computer in M-Division's User Service Center at Lawrence Livermore National Laboratory (LLNL), where data can be analyzed offline from the main TMX-U acquisition computers. When combined with interactive data analysis programs, these tools provide the capability to do batch-style processing or interactive data analysis on the computers in the USC or the supercomputers of the National Magnetic Fusion Energy Computer Center (NMFECC) in addition to the normal processing done by the TMX-U acquisition system. One database tool provides highly reduced data for searching and correlation analysis of several diagnostic signals within a single shot or over many shots. A second database tool provides retrieval and storage of unreduced data for use in detailed analysis of one or more diagnostic signals. We will show how these database tools form the core of an evolving offline data analysis environment on the USC computers.

30985 **(UCRL—93970) ICRF heating of passing ions in TMX-U.** Molvik, A.W.; Dimonte, G.; Barter, J.; Campbell, R.; Cummins, W.F.; Falabella, S.; Ferguson, S.W.; Poulsen, P. (Lawrence Livermore National Lab., CA (USA)). Apr 1986. Contract W-7405-ENG-48. 5p. (CONF-860412—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009405.

From 13. European conference on controlled fusion and plasma heating; Schliersee, F.R. Germany (14 Apr 1986).

By placing ion-cyclotron resonant frequency (ICRF) antennas on both sides of a midplane gas-feed system in the central cell of the Tandem Mirror Experiment-Upgrade (TMX-U), our results have improved in the following areas: (a) The end losses out both ends show a factor of 3 to 4 increase in passing-ion temperatures and a factor of 2 to 3 decrease in passing-ion densities. (b) The passing-ion heating is consistent with Monte Carlo predictions. (c) The plasma density can be sustained by ICRF plus gas fueling as observed on other experiments.

30986 **(UCRL—94207-Rev.1) Question of consistent boundary conditions when simulating reversed field pinch dynamics. Revision 1.** Mirin, A.A. (Lawrence Livermore National Lab., CA (USA)). Mar 1986. Contract W-7405-ENG-48. 24p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009609.

The issue of proper boundary conditions when performing magnetohydrodynamic simulations of the reversed field pinch is examined. Of particular concern is the choice of constant current, which when combined with other commonly used boundary conditions, may, under careless implementation, lead to an inconsistency. It is shown that this may cause erroneous results. Cases both with and without Hall terms are presented.

30987 **Low-temperature plasma near a tokamak reactor limiter.** Braams, B.J.; Singer, C.R. (Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ 08544). *Fusion Technology;* **9**: No. 2, vp(Mar 1986).

Analytic and two-dimensional computational solution for the plasma parameters near a toroidally symmetric limiter are illustrated for the projected parameters of a tokamak fusion core experiment (TFCX). The temperature near the limiter plate is below 20 eV, except when the density 10 cm inside the limiter contact is 8 x 10^{13} cm^{-3} or less and the thermal diffusivity in the edge region is 2 x 10^4 cm^2/S or less. Extrapolation of recent experimental data suggests that neither of these conditions is likely to be met near ignition in TFCX, so as a low plasma temperature near the limiter should be considered a likely possibility.

30988 **Electron cyclotron heating at down-shifted frequencies in existing tokamak devices.** Mazzucato, E.; Fidone, I.; Giruzzi, G.; Krivenski, V. (Princeton Univ., NJ, USA. Plasma Physics Lab.; Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92, France. Dept. de Recherches sur la Fusion Controlee). *Nuclear Fusion;* **26**: No. 1, 3-9(Jan 1986).

Plasma heating in existing tokamak devices by electron cyclotron waves with frequency (f) significantly smaller than the electron gyrofrequency (fsub(c)) is investigated for the case of Maxwellian plasmas. It is shown that for central electron temperatures larger than 3 keV, strong absorption of extraordinary waves can occur at values of the toroidal field for which the condition f=fsub(c) is not satisfied in the plasma region. The cases of f=60 GHz and f=100 GHz are discussed for the PLT and TFTR devices as being representative of medium (approx. 30 kG) and high (approx. 50 kG) magnetic field tokamaks, respectively. Numerical calculations with a ray tracing code indicate that most of the RF energy is absorbed in a central plasma region. These results are of practical interest because they significantly simplify the main technical problem of ECH in a tokamak reactor, i.e. the development of high-frequency and high-power microwave sources.

30989 **Divertor and edge plasma properties in Doublet III expanded boundary discharges.** Kahn, C.; Burrell, K.H.; Ejima, S.; Fairbanks, E.; Petrie, T.; Shimada, M.; Washizu, M. (GA Technologies, Inc., San Diego, CA, USA). *Nuclear Fusion;* **26**: No. 1, 73-83(Jan 1986).

Edge plasma conditions and their variation with main plasma density and with neutral-beam input power are presented for expanded boundary divertor discharges produced in the Doublet III tokamak. The density and temperature in the divertor plasma and the heat flux to the divertor plates not only change with the main plasma density and neutral-beam input power but also depend on

the level and type of recycling activity present in the divertor. However, the shape of the heat flux profile on the divertor plates is quite insensitive to variations in divertor properties. This insensitivity, together with the weak increase of peak heat flux on the divertor plate with input power, is favourable for the use of an expanded boundary divertor in future fusion reactors. Owing to the similarity of the magnetic configuration, the results from the expanded boundary divertor should be directly applicable to the divertor design for INTOR.

30990 **Top-versus-side launch of lower hybrid waves in PLT.** Bernabei, S.; Bell, R.; Chu, T.K. (Princeton Univ., NJ, USA. Plasma Physics Lab.). *Nuclear Fusion;* **26**: No. 1, 111-114(Jan 1986).

Experiments with the PLT 2.45 GHz system show that lower hybrid waves launched from the top of the tokamak torus are about half as effective for current drive as an identical spectrum of waves launched from the outside of the torus at intermediate densities (1-2 x $10^{13}cm^{-3}$).

30991 **Effects of alpha particles on the scattering function in CO_2 laser scattering.** Vahala, L.; Vahala, G.; Sigmar, D.J. (College of William and Mary, Williamsburg, VA, USA. Dept. of Physics; Massachusetts Inst. of Tech., Cambridge, USA. Plasma Fusion Center). *Nuclear Fusion;* **26**: No. 1, 51-60(Jan 1986).

It is shown that the alpha-particle contribution to the scattered power can be dominant in the coherent scattering of a CO_2 laser in a Maxwellian plasma. For Tsub(i)=Tsub(e)=10 keV, the optimal forward-scattering angle is around 1.0 deg., with detection of the electron density fluctuation wave numbers ksub(perpendicular) >> ksub(parallel) (relative to the toroidal magnetic field). A strong resonance occurs at the lower hybrid frequency. Because of the strong dependence of the scattered signal on the alpha-particle temperature and the alpha distribution function, it seems feasible that CO_2 laser scattering, using heterodyne techniques, could give detailed local information on fusion alphas.

30992 **Note on the Mirnov signal analysis in tokamaks.** Kikuchi, M. (Princeton Univ., NJ, USA. Plasma Physics Lab.). *Nuclear Fusion;* **26**: No. 1, 101-107(Jan 1986).

The relation between Mirnov coil signals and the current perturbation on a rational surface is examined analytically by using the approximate Green's function for the case of large-aspect-ratio circular tokamaks. Satellite island formation, phase modulation effects due to the poloidal variation of the field line pitch, and the effect of the shift of the plasma column with respect to the centre of the vacuum chamber are examined. The detectability of these effects by Mirnov coils is discussed for the TFTR experiment.

30993 **Non-ideal ballooning modes in a tokamak.** Dominguez, R.R.; Moore, R.W. (GA Technologies, Inc., San Diego, CA, USA). *Nuclear Fusion;* **26**: No. 1, 85-100(Jan 1986).

Hybrid two-fluid and kinetic equations have been used to study ballooning modes in a tokamak. These modes separate into two branches: a modified ideal magnetohydrodynamic (MHD) ballooning mode and a toroidally induced ion temperature gradient (etasub(i)) mode. Using both model and actual high beta equilibria we find that the etasub(i) mode (etasub(i)=deltaIn Tsub(i)/deltaInNsub(i)) may dominate the ideal MHD mode for moderate etasub(i)(etasub(i) > or approx. 1), leading to substantially lower beta thresholds.

30994 **ICRF fusion reactivity enhancement in tokamaks.** Harvey, R.W.; Chiu, S.C.; McCoy, M.G.; Kerbel, G.D. (GA Technologies, Inc., San Diego, CA, USA; Lawrence Livermore National Lab., CA, USA). *Nuclear Fusion;* **26**: No. 1, 43-49(Jan 1986).

A systematic study of ICRF fusion reactivity enhancement has been conducted, using a new bounce-averaged two-dimensional Fokker-Planck code. Second-harmonic heating of deuterium in a 50-50 DT plasma is assumed, and the results are obtained as a function of background plasma density and temperature. An enhancement factor of ten is achieved at low Q (= fusion power/RF power), which is important for ion-tail diagnostics, but at Q=0.5 the enhancement is < or approx. 2. Significant poloidal variations in ion density (up to 14%) and in fusion reactivity (by a factor up to 2.5) are found.

30995 **Confinement studies in TFTR.** Murakami, M.; Arunasalan, V.; Bell, J.D.; Bell, M.G.; Bitter, M.; Blanchard, W.R.; Boody, F.; Boyd, D.; Bretz, N.; Bush, C.E. (Plasma Physics Laboratory, Princeton University, Princeton, NJ). *Fusion Technology;* **8**: No. 1, 657-663(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The paper describes the present (end of February 1985) status of the plasma confinement studies in the TFTR tokamak with emphasis on those with neutral beam injection (NBI). Recent improvements in the device capabilities have substantially extended operating parameters: B /sub T/ increased to 4.0 T, I /sub p/ to 2.0 MA, injection power (P /sub b/) to ° MW with H^0 or D^0 beams, n /sub e/ to 5 x 10^{19} m^{-3} and Z /sub eff/ reduced to 1.4. With ohmic heating (OH) alone, the previously established scaling for gross energy confinement time (T /sub E/ ° n /sub e/ q) has been confirmed at higher I /sub p/ and B /sub T/ , and the maximum T /sub E/ of 0.4 sec has been achieved. With NBI at P /sub b/ substantially (by factor > 2) higher than P /sub OH/ , excellent power and particle accountability have been established. This suggest that the less-than-expected increase in stored energy with NBI is not due to problems of power delivery, but due to problems of confinement deterioration. T /sub E/ is observed to scale approximately as I /sub p/ P /sub b/ /sup 0.5/ (independent of n /sub e/), consistent with previous L-mode scalings. With NBI we have achieved the maximum T /sub E/ of 0.2 s and the maximum T / sub i/ (o) of 4.4 keV in the normal operating regime, and even higher T /sub i/ (o) in the energetic-ion regime with low-n /sub e/ and low I /sub p/ operation.

30996 **Plasma engineering models of tandem mirror devices with high-field test-cell inserts.** Fenstermacher, M.E.; Campbell, R.B. (TRW Inc., Redondo Beach, CA). *Fusion Technology;* **8**: No. 1, 668-673(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Plasma physics and engineering models of tandem mirror devices operated with a high-field technology test-cell insert in the central cell, which have been incorporated recently in the TMRBAR tandem mirror reactor physics code, are described. The models include particle and energy balance in the test-cell region as well as the interactions between the test-cell particles and those flowing through the entire device. The code calculations yield consistent operating parameters for the test-cell, central cell, and end cell systems. A benchmark case for the MFTF-α+T configuration is presented which shows good agreement between the code results and previous calculations.

30997 **Physics-magnetics trade studies for tandem mirror reactors.** Campbell, R.B.; Blackfield, D.T.; Perkins, L.J. (Lawrence Livermore National Lab., Livermore, CA). *Fusion Technology;* **8**: No. 1, 674-679(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

We describe and present results obtained from the optimization package of the Tandem Mirror Reactor Systems Code. We have found it to be very useful in searching through multidimensional parameter space, and have applied it here to study the effect of choke coil field strength and net electric power on cost of electricity (COE) and mass utilization factor (MUF) for MINIMARS type reactors. We have found that a broad optimum occurs at B / sub choke/ = 26 T for both COE and MUF. The COE economy of scale approaches saturation at quite low powers, around 600 MW(e). The saturation is mainly due to longer construction times for large plants, and the associated time related costs. The MUF economy of scale does not saturate, at least for powers up to 2400 MW(e).

30998 **Engineering issues in muon-catalyzed fusion.** Jones, S.E. (Idaho National Engineering Laboratory, Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 1511-1524(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Negative muons (elementary particles having a mean life of 2.2 microseconds) have been used to induce nuclear fusion reactions of the type: $\mu^- + d + t \rightarrow {}^4He + n + \mu^-$. Behaving like a very heavy electron, a muon forms a tightly bound deuteron-triton-muon ($dt\mu$) molecule. Fusion then ensues, typically in picoseconds, as the nuclei tunnel through the Coulomb repulsive barrier. Up to 160 fusions per muon (average) have been observed in cold deuterium-tritium mixtures. Thus, the process may be called muon-catalyzed fusion, or "cold" fusion. The fusion energy thus released is twenty times the total energy of the muon driving the fusion reaction. However, the energy needed to produce the muon catalysts is currently much larger than the fusion energy released. In preparing for muon-catalyzed fusion experiments, a number of engineering challenges were encountered and successfully resolved. Similar challenges would be faced in a (hypothetical) cold fusion reactor. High-temperature plasmas and many associated difficulties are of course circumvented. However, the gaseous d-t fuel must be contained at elevated temperatures (about 400°C) and near-liquid density. (Experiments show that increasing either parameter enhances the fusion yield.) This translates into high gas pressures (about 10^8Pa) and a new class of engineering challenges. Material strength and fabricability, hydrogen permeation and material embrittlement, tritium inventory and safety concerns, muon beam scattering and degradation, and reaction vessel geometries are among critical engineering considerations.

30999 **Modeling of non-Gaussian beamlet profile based on total-beam power loss and transmission.** Kim, J.; Stewart, L.D. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 1717-1721(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The angular intensity profile of a single beamlet is expressed as a sum of a main Gaussian and a bump-on-the-tail representing the optical aberration. Transmission of a total beam comprised of a large number of beamlets is then analytically derived. By an iterative matching of the calculated transmissions to the measured transmissions through at least two downstream openings, the parameters that describe the single beamlet angular profile are determined. Some of the neutral beam injectors employed for heating fusion plasmas are characterized by this modeling. Also presented is an improved algorithm for calculating the intensity distribution at a downstream plane.

31000 **Optimal control theory applied to fusion plasma thermal stabilization.** Sager, G.; Maya, I.; Miley, G.H. (Fusion Studies Laboratory, Univ. of Illinois, Urbana, IL). *Fusion Technology;* 8: No. 1, 1795-1800(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Optimal control theory is applied to determine feedback control for thermal stability of a driven, subingnition tokamak controlled by fuel injection and additional heating. It was found that the simplifications of the plasma burn dynamics and the control figure of merit required for the synthesis of optimal feedback laws were valid. Control laws were determined which allowed thermal stability in plasmas subject to 10% offset in temperature. The minimum ignition margin (defined as the difference between ignition temperature and the subignition operating point) was found to be 0.95 keV, corresponding to steady state heating requirements of less than 2% of fusion power.

31001 **Shielding analysis for the horizontal x-ray imaging system on the TFTR.** Liew, S.L.; Hill, K.W.; Kolibal, J.; Ku, L.P. (Princeton University, Plasma Physics Laboratory, Princeton, NJ). *Fusion Technology;* 8: No. 1, 1020-1025(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Intense neutron and gamma radiation will accompany the reactor like DD and DT plasmas that are planned to be generated on the TFTR. Since many plasma diagnostic systems use detectors that are sensitive to neutrons and gamma-rays to various degrees, local shielding will be required to achieve acceptable signal to noise ratios during those high power operations. In this paper, we analyze the shielding problems related to the horizontal x-ray imaging system.

31002 **Low activation diagnostic equipment design studies.** Hopkins, G.R.; Cheng, E.T.; Fisher, R.K. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 1402-1407(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The low activation fusion concept has been applied to the diagnostic equipment in a fusion reactor. The components where fabrication from low activation materials is feasible have been identified. Other systems where higher activation elements are required can have their activation reduced by design approaches which include shielding and operation only in low flux regions of the reactor. Some components will not operate in a high flux so activation is not a major concern. This low activation diagnostic equipment study completes a series of low activation studies where all the components in a fusion power reactor have now been evaluated. It is concluded that a completely low activation fusion reactor is feasible with all components meeting the functional requirements. This provides an environmentally benign energy source with a high confidence level in meeting safety criteria in operation, maintenance and waste disposal.

31003 **Plasma instrumentation for fusion power reactor control.** Sager, G.T.; Bauer, J.F.; Maya, I.; Miley, G.H. (Fusion Studies Laboratory, Univ. of Illinois, Urbana, IL). *Fusion Technology;* 8: No. 1, 1789-1794(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Feedback control will be implemented in fusion power reactors to guard against unpredicted behavior of the plant and to assure desirable operation. In this study, plasma state feedback requirements for plasma control by systems strongly coupled to the plasma (magnet sets, RF, and neutral beam heating systems, and refueling systems) are estimated. Generic considerations regarding the impact of the power reactor environment on plasma instrumentation are outlined. Solutions are proposed to minimize the impact of the power reactor environment on plasma instrumentation. Key plasma diagnostics are evaluated with respect to their potential for upgrade and implementation as power reactor instruments.

31004 **TFTR plasma feedback systems.** Efthimion, P.; Hawryluk, R.J.; Hojsak, W.; Marsala, R.J.; Mueller, D.; Rauch, W.; Tait, G.D.; Taylor, G.; Thompson, M. (Princeton Plasma Physics Laboratory, Princeton, NJ). *Fusion Technology;* 8: No. 1, 1807-1814(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Tokamak Fusion Test Reactor employs feedback control systems for four plasma parameters, i.e. for plasma current, for plasma major radius, for plasma vertical position, and for plasma density. The plasma current is controlled by adjusting the rate of change of current in the Ohmic Heating (OH) coil system. Plasma current is continuously sensed by a Rogowski coil and its associated electronics; the error between it and a preprogrammed reference plasma current history is operated upon by a "proportional-plusintegral-plus-derivative" (PID) control algorithm and combined with various feedforward terms, to generate compensating commands to the phase-controlled thyristor rectifiers which drive current through the OH coils. The plasma position is controlled by adjusting the currents in Equilibrium Field and Horizontal Field coil systems, which respectively determine the vertical and radial external magnetic fields producing J X B forces on the plasma current. The plasma major radius position and vertical position, sensed by "B / sub theta/ " and "B /sub ϱho/ " magnetic flux pickup coils with their associated electronics, are controlled toward preprogrammed

reference histories by allowing PID and feedforward control algorithms to generate commands to the EF and HF coil power supplies. Plasma density is controlled by adjusting the amount of gas injected into the vacuum vessel. Time-varying gains are used to combine lineaveraged plasma density measurements from a microwave interferometer plasma diagnostic system with vacuum vessel pressure measurements from ion gauges, with various other measurements, and with preprogrammed reference histories, to determine commands to piezoelectric gas injection valves.

31005 **Tokamak arc damage.** Murray, J.G.; Gorker, G.E. (Princeton University, Plasma Physics Laboratory, Princeton, NJ). *Fusion Technology;* 8: No. 1, 664-667(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Tokamak fusion reactors will have large plasma currents of approximately 10 MA with hundreds of megajoules stored in the magnetic fields. When a major plasma instability occurs, the disruption of the plasma current induces voltage in the adjacent conducting structures, giving rise to large transient currents. If disruption-induced currents flow across the gaps long enough, they become concentrated constrictive arc columns that cause high electrode erosion. This report reviews a tokamak arcing scenario and provides guidelines for designing tokamaks to minimize the possibility of arc damage.

31006 **Simulating the effects of plasma disruption with A 1 MA current pulse in a coaxial test fixture.** Praeg, W.F. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 245-250(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A test fixture for simulating plasma disruptions, comprising two coaxial cylinders, has been designed for use with Argonne's electromagnetic test facility FELIX. A pulsed power supply drives a half cycle sine wave current of 10^9 A through the test fixture generating fields of < 2 T and field changes of < 1250 T s^{-1}. The coaxial structure is 140 cm long, has an outer cylinder with an OD of 78 cm and an inner cylinder with an OD of 8.3 cm. It is surrounded by the FELIX solenoid field of 1 T. This proposed upgrade of the FELIX facility should be useful for testing the effect of plasma disruption on First Wall-Blanket-Shield (FWBS) structures; a future upgrade of the solenoid field to 4 T will allow to simulate reactor conditions even better.

31007 **Alpha-driven fast magnetosonic wave heating in tokamak plasmas.** Sutton, W.R.; Miley, G.M.; Sigmar, D.J. (University of Illinois, Fusion Studies Laboratory, Urbana, IL). *Fusion Technology;* 7: No. 3, 374-390(May 1985).

An alpha-driven fast magnetosonic wave instability is investigated in tokamak plasmas for propagation transverse to the external magnetic field at frequencies several times the alpha gyrorate. A two-dimensional differential quasi-linear diffusion equation is derived in cylindrical v-v geometry. The quasi-linear diffusion coefficients in the small parameter k/k are expanded and the problem is reduced to one dimension by integrating out the v dependence. Reactor relevant information is obtained using data from the one-dimensional formulation in a 1 1/2-dimensional tokamak transport code. Contour plots of the alpha threshold fraction are used to identify the instability regions in the n /sub e/ -T /sub i/ plane. Alpha/background electron fractions as low as 10^{-6} to 10^{-4} may trigger the instability. For a typical reactor-size tokamak, an enhancement of the fraction of the alpha energy transferred to ions by as much as 1.5 can occur for T /sub i/ = T /sub e/ at 7 keV. Still, due to the rapid equilibration of electron and ion temperatures, a <1 to 2% increase in fusion power occurs overall.

31008 **Neutral beam orientation on the Tokamak Fusion Test Reactor.** Mikkelsen, D.R.; Goldston, R.J.; Singer, C.E. (Plasma Physics Laboratory, Princeton University, Princeton, NJ). *Fusion Technology;* 7: No. 3, 361-373(May 1985).

The efficiency of plasma heating and current drive expected in the Tokamak Fusion Test Reactor has been computed for various orientations of neutral injection beamlines. Computer codes that model plasma transport and particle orbits have been used to compute power losses caused by "shinethrough," charge-exchange, intersection of particle orbits with the limiter or wall, and toroidal field ripple, and to compute the effect of finite size particle orbits on penetration of injected beam particles. Less readily quantifiable considerations such as impurity contamination and toroidal plasma rotation are discussed briefly.

31009 **Strategic framework for the magnetic fusion energy program.** Conn, R.W.; Davidson, R.C.; Fowler, T.K.; Furth, H.P.; Gilleland, J.A.; Rosenbluth, M.N. (Univ. of California, Los Angeles). *Journal of Fusion Energy;* 4: No. 1, 5-10(1985).

Fusion is recognized as a sufficiently abundant and environmentally attractive energy source to sustain industrial society in the 21st century and beyond. This paper outlines a strategic framework for the US magnetic fusion program that builds substantially on the high-quality research and the strong scientific and technological basis that has been established during the past two decades. 1 reference.

31010 **Theory of the plasma edge: recycling sheaths.** Whealton, J.H.; Bell, M.A.; Milora, S.L.; Raridon, R.J.; Stirling, W.L.; Tsai, C.C. (Oak Ridge National Lab., Oak Ridge, TN). pp HA-4 of 37th annual gaseous electronics conference. Beatty, E.C. Boulder, CO; University of Colorado (1984). (CONF-841086—).

From 37. gaseous electronics conference; Boulder, CO, USA (9 Oct 1984).

We consider the models for a plasma edge consisting of (a) Vlasov equations for plasma positive ions, in the plasma sheaths near a metal boundary, (b) Vlasov equations for electrons and/or neutrals thus ejected from such surfaces and (c) Vlasov equations for subsequent ionization and dissociation of volume-produced particles. These Vlasov equations are solved simultaneously with Poisson's equation in as many dimensions as desired with boundaries of arbitrary shape and connectivity. These calculations are applied to plasma edge pumps and ion deposition situations to determine pumping efficiency as a function of boundary shape and uniformity of ion deposition on irregular surfaces. This model is highly nonlinear and heretofore unsolvable for problems of this variety.

31011 **Heating and pumping studies in the end cells of tandem-mirror reactors.** Devoto, R.S. (University of California, Lawrence Livermore National Laboratory, Livermore, CA). pp 23-24 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

The end cells of tandem mirrors contain regions where hot ions must be confined and where warm trapped ions must be pumped out. In the current MARS reactor design, hot ions are confined in the plug, where the thermal barrier and axial confinement potential are also located, and in the anchor which lies between the plug and a high-field (24T) choke coil. In this reactor, passing ions which trap must be pumped from the transition section between the high field choke coil and the anchor, and from the plug. Studies of the trapping and loss rates of these ions can be carried out by solution for the ion distribution function. Two specific problems have been addressed with the aid of a numerical code which solves the bounce-average Fokker-Planck equation: pumping of ions trapped in the transition region and confinement of hot ions as well as pumping in the plug. Transition studies have focused on the effect of different locations of charge-exchange pump beams on required current and beam energy. Since the ions which result from charge exchange must pass into the central cell, the beam energy must be high enough to overcome the potential difference to the central cell. To minimize the energy, it is desirable to pump near the mirror, but such a pump beam does not intersect orbits of deeply trapped ions and even with very large beam currents, the distribution function cannot be distorted sufficiently to attain the required trapped density. However, pumping at about half the maximum field is found to be satisfactory and to even reduce the required beam current over cases with uniform pumping.

31012 **Selective heating and separation of isotopes in a metallic plasma.** Moffa, P.; Cheshire, D.; Flanders, B.; Myer, R.; Robinette, W.; Thompson, J.; Young, S. (TRW Energy Research Center, Redondo Beach, CA). pp 69-70 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

Several types of metallic plasmas have been produced at the Plasma Separation Process facility of TRW. Selective heating and separation of specific isotopes in these plasmas have been achieved. In this presentation the authors concentrate on the modeling of the selective heating and separation of the isotope Ni^{58}. Two models are currently used to describe the excitation process. In both, the electromagnetic fields in the plasma produced by the ICRH antenna are calculated self-consistently using a kinetic description of the warm plasma dielectric. In the Process Model Code, both the production of the plasma and the heating are calculated using a Monte Carlo approach. Only the excitation process is treated in the second simplified model. Test particles that sample an initial parallel velocity distribution are launched into the heating region and the equations of motion including collisional damping are calculated. For both models, the perpendicular energy for a number of particles with different initial conditions and representing the different isotopes is calculated. This information is then input into a code that models the performance of our isotope separation collector. The motion of the ions of each isotope through the electrically biased collector is followed. An accounting of where each particle is deposited is kept and hence the isotope separation performance of the collector is predicted.

31013 **Preliminary neutral density measurements in EBT using a diagnostic neutral beam.** Glowienka, J.C.; Davis, W.A.; Swain, D.W. (Oak Ridge National Laboratory, Oak Ridge, TN). pp 24 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

The neutral density of a plasma can be determined by measuring the charge-exchange decay time of an energetic ion population. The neutral density is inversely proportional to the decay time if the dominant loss mechanism is charge exchange. In EBT, a 20 keV, magnetically focussed, low fluence (about 10 mA) neutral hydrogen beam (a SARA** source) is injected perpendicular to the magnetic field in the midplane between magnets. An energetic ion population is trapped in the midplane primarily by charge exchange with cold plasma ions. The beam is repetitively pulsed, and the decay is observed with a conventional charge-exchange energy analyzer. The energetic ion population fills a thin disk-like volume with dimensions defined by the beam diameter (about 1 cm) and the plasma diameter (about 30 cm). However, the origin of the detected signal is highly center weighted. The data show signal-to-noise ratios that are greater than 100 and decays that are well suited to exponential fits. Decay measurements were performed in gas trapping experiments (no ECH) and in plasma trapping experiments in EBT-I and EBT-S using hydrogen and deuterium plasmas. Decay times from gas trapping compare well with predictions of the molecular hydrogen gas density from the toroidal vessel pressure gage and show no saturation with pressure. In contrast, plasma trapping experiments show short decay times that imply neutral atomic hydrogen densities of order 10^{11} cm^{-3} or greater; this is an order of magnitude larger than neutral densities determined by H /sub alpha/ spectroscopy. Plasma trapping experiments also show a saturation at low pressures near the T-M transition.

31014 **Current profile diagnostic development on text using the Zeeman effect.** Thomas, D.M.; Baur, J.F.; Ensberg, E.S.; West, W.P. (GA Technologies Inc., San Diego, CA). pp 13 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

The current density profile diagnostic system has been installed on the TEXT device. The present setup comprises a high-energy (E = 95 keV) neutral ^{6}Li beam, a cw dye laser, and a fluorescence detection system. In principle, the technique under development will permit measurement of the magnetic field direction simultaneously at several discrete points within the tokamak throughout the duration of the discharge. The lithium beam is injected radially into the plasma collinearly with the cw dye laser beam, which is tuned into resonance with the π-component of the lithium Zeeman triplet. The laser light is linearly polarized and passes through an electro-optic crystal ($LiNiO_3$) which rotates the plane of the polarization at 50 kHz. Since the π-component is linearly polarized parallel to the magnetic field, the laser induced fluorescence signal is modulated at 100 kHz. The phase of the fluorescence signal relative to a laser reference signal is directly proportional, to the direction of the magnetic field. The fluorescence of the beam is observed at several points along the radius of the machine; and phasesensitive detection techniques may be used to determine the local field direction at the various observation positions. Since the toroidal component of the magnetic field is known as a function of radius, the poloidal field due to the plasma current may be determined.

31015 **Tokamak plasma density fluctuation studies using a multichannel scattering apparatus.** Park, H.; Luhmann, N.C.; Peebles, W.A.; Taylor, R.J. (University of California, Los Angeles, CA). pp 16-17 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

This paper discusses the development of a multi-angle FIR scattering apparatus used to obtain Tokamak plasma wave dispersion relations on a single shot basis, eliminating the possible ambiguities resulting from variation of plasma parameters. The scattering apparatus was carefully calibrated using acousto-optical techniques as well as standard hot-cold receiver sensitivity procedures. The system has been employed to study two different frequency regimes of density fluctuation - naturally occurring microturbulence and externally driven ICRF waves.

31016 **A photon-counting detector for doppler width ion temperature measurements.** Benjamin, R.; Moos, H.W.; Nudelfuden, A. (The Johns Hopkins University, Baltimore, MD). pp 41-42 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

The three most common methods of determining the ion temperature profile in plasma fusion machines are discussed in this article. The kinetic temperature of the impurity ions can be determined by mesuring the doppler broadening of the emission lines of these impurities, a method which is not hampered as machines get larger and is much less sensitive to deviations from a Maxwellian distribution. The authors are designing and constructing a photon-counting detector for doppler broadening measurements in the ultraviolet spectral region between 1200-3000 angstroms to be used in the determination of ion temperature profiles.

31017 **X-ray spectra for 10 keV less than h v less than 100 keV from the Alcator C tokamak.** Rice, J.E.; Kallne, E.; Kallne, J. (Massachusetts Institute of Technology, Cambridge, MA). pp 55 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

X-ray emission between 10 and 100 keV has been observed from the Alcator C tokamak using a new HgI_2 x-ray detector and pulse-height-analysis system and is discussed in this paper. This spectrometer operates at room temperature and provides access to the intermediate energy portion of x-ray emission between the regions normally viewed by Si(Li) and NaI detectors. Spectra have been obtained during normal high density operation, at lower densi-

ties and for discharges when RF power is introduced into the plasma. Information concerning the electron distribution function obtained from the x-ray spectrum are compared with measurements of electron cyclotron emission.

31018 **Edge turbulence in the PRETEXT Tokamak.** Levinson, S.J.; Beall, J.M.; Bengtson, R.D.; Powers, E.J. (University of Texas at Austin, Austin, TX). pp 54-55 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

This article examines how the application of a fixed-Langmuir probe dignostic for the investigation of turbulence allows the estimation of a local wavenumber-frequency spectral density function in the edge region of the PRETEXT Tokamak. The technique offers a complementary alternative to scattering diagnostics in that the probes provide a highly localized measurement with good poloidal wave-number resolution. In addition, the entire spectral density function may be estimated from a single shot data.

31019 **Transverse electric fields inferred from electron losses and ion beam dynamics in a Magnetically Insulated Diode.** Maron, Y.; Hammer, D.A.; Litwin, C. (Cornell University, Ithaca, NY). pp 33 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

Electron losses and ion beam divergence were studied locally and simultaneously in the LONGSHOT Magnetically Insulated Diode (MID), an angular MID with radial insulation field, circa 100 kV applied field and a circa 600 ns pulse. The correlation between observations of these two phenomena allows a better understanding of the sources of ion beam divergence and its relation with the electron flux to the anode. In this paper, the observations are briefly summarized and conclusions are presented as to the electrostatic potential configurations which must be present near the anode to produce the observed phenomena. The ion beam divergence from the LONGSHOT diode was measured by allowing a portion of the ion beam to pass through a 1.4 cm diameter aperture and to hit a scintillator which was photographed with a streak camera.

31020 **Theoretical modeling of the plasma opening switch.** Ottinger, P.F.; Goldstein, S.A.; McDonald, S.; Meger, R.A. (Naval Research Laboratory, Washington, DC). pp 34 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

Recent experiments at NRL have demonstrated that plasma can be used as the switching medium in a fast opening switch. Pulsed power applications for such switches are manyfold, including propulse suppression, risetime sharpening, inductive storage and pulse compression. Each application requires individual attention to geometry, plasma parameters, timescales, etc. Theoretical modeling of the basic physical mechanisms involved in the opening process are described. Emphasis is placed on relating the model to new experiments at NRL. The theoretical model includes effects due to injected plasma drift motion, surface erosion and the self-consistent magnetic field.

31021 **The source of heavy impurities in the Alcator C Tokamak.** Rice, J.E.; Marmar, E.S. (Massachusetts Institute of Technology, Cambridge, MA). pp 55-56 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

An anomalous impurity diffusion coefficient has been determined from a series of impurity injection experiments performed on the Alcator C Tokamak. An impurity transport code, which includes this empirical diffusion coefficient, has been used to model intrinsic impurity emission. Comparison of the code predictions with observations of intrinsic molybdenum, chlorine and sulphur emission provides information about the source of these impurities. A variety of scalings of the emission of molybdenum have been documented.

31022 **Measurements of high frequency fluctuations in EBT.** Rasmussen, D.A.; Batchelor, D.B. (Oak Ridge National Laboratory, Oak Ridge, TN). pp 19 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

Loop antennaes have been used to make time and frequency resolved measurements of radiation emitted from the ELMO Bumpy Torus (EBT) in the 1-30 GHz range. Both cw and burst oscillations have been observed over the range of 1-10 GHz (0.035-0.35 ω /sub ce/) when EBT is operated in the T-mode regime. These oscillations increase in amplitude as the fill pressure is reduced to the T-M transistion. The cw oscillations are observed at approximately 1.5, 2.4 and 6.7 GHz. These oscillations have little or no frequency dependence on fill pressure, magnetic field strength or the heating microwave power level or frequency. The burst type oscillations are observed in the ranges of 2-4 GHz and 6-8 GHz. The time between consecutive burst can be as fast as a couple of milliseconds. The frequency and amplitude dependence of these bursts have been measured as a function of fill pressure, magnetic field strength and heating frequency. The bursts could be associated with Whistler activity due to temperature anisotropy of the hot electron rings. A more thorough investigation of both types of oscillations and their effects, if any, on the EBT plasma is currently underway.

31023 **Electric and magnetic excitation of ICRF waves: eigenmodes and wave packets.** Greene, G.J.; Gould, R.W. (California Institute of Technology, Pasadena, CA). pp 18 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

Excitation of waves in the ion cyclotron range of frequencies has been investigated for a variety of antennas in the Caltech Research Tokamak. Two approaches were used to characterize the antenna-plasma interaction: measurements of the antenna RF input impedance, and amplitude and phase measurements of the magnetic fields associated with the waves. Both continuous excitation (leading to toroidal eigenmodes) and tone-burst excitation (launching wave-packets) were employed. Small antenna structures were mounted on the end of a 1-meter coaxial RF feeder section which also formed the vacuum feedthru. Magnetic loop-antenna structures investigated included bare loops, ceramic-insulated loops, and baffled and Faraday-shielded loops. Electric-field antennas included bare plates, insulated plates, T-shaped rods, and small cylinders and were driven with respect to the chamber wall. The antenna loading impedance was obtained directly by measuring the RF current and voltage and the phase between the two at the input to the RF feeder section. This approach has the advantage that the measurements are made on the antenna side of the matching network and are thus independent of its setting. The I-V phase change during the plasma shot is often quite small and requires a high-sensitivity, low-noise phase detector.

7002 Fusion Power Plant Technology

REFER ALSO TO CITATION(S) 30080, 30081, 30085, 30089, 30090, 30097, 30409, 30901, 30989, 30994, 30997, 31001, 31002, 31005, 31006, 31008

31024 **(CONF-860170—2) Compact ignition tokamak design studies.** (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009504.

From Ignition Technical Oversight Committee meeting; Austin, TX, USA (20 Jan 1986).

Viewgraphs are given on the following objectives of the design study: (1) develop core module concept, (2) develop a method to apply preload, (3) perform sufficient analysis to demonstrate total concept is structurally sound, (4) develop component fit-up and assembly scheme, and (5) minimize size and cost. (MOW)

31025 **(CONF-860170—3) Compact ignition tokamak design studies.** Brown, T.G. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 38p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009511.

From Ignition Technical Oversight Committee meeting; Austin, TX, USA (20 Jan 1986).

A two-part reactor design was conducted on the reactor core design and the preload system. Viewgraphs from the meeting are presented. (MOW)

31026 **(CONF-860412—5) ICRF heating technology development activities at Oak Ridge National Laboratory.** Baity, F.W.; Bryan, W.E.; Hoffman, D.J.; Schechter, D.E.; Owens, T.L. (Oak Ridge National Lab., TN (USA); McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 1986. Contract AC05-84OR21400. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010018.

From 13. European conference on controlled fusion and plasma heating; Schliersee, F.R. Germany (14 Apr 1986).

The rf technology program at the Oak Ridge National Laboratory (ORNL) is developing the components needed for heating in the ion cyclotron range of frequencies (ICRF) on future fusion machines, such as the Compact Ignition Tokamak. Components produced in this program are already in use on experiments throughout the world, including Doublet III-D (DIII-D), TMX-U, Alcator-C, and TEXTOR. Designs have been developed for implementation on Tore Supra and ASDEX. Recent developments in vacuum feedthroughs, compact loop antennas, high-current capacitors, and folded waveguides are discussed in this paper.

31027 **(CONF-860412—6) Folded waveguide cavity coupler for ICRF heating.** Owens, T.L. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 1986. Contract AC05-84OR21400. 5p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010022.

From 13. European conference on controlled fusion and plasma heating; Schliersee, F.R. Germany (14 Apr 1986).

This paper introduces a new type of waveguide coupler for ion cyclotron range of frequencies (ICRF) heating which is an adaptation of a concept known as a "folded waveguide" reported by Barrow and Schaevitz in connection with low-frequency waveguide transmission systems. The basic idea involves "folding" a simple rectangular waveguide to form a more compact structure. Cutoff for the folded waveguide occurs when one-half of a free-space wavelength equals the path length around the "folds" of the structure. By adding a large number of folds, the path length around the folds can be made large, leading to very low cutoff frequencies relative to those for simple rectangular waveguides having comparable outside dimensions. Folded waveguide couplers are practical for frequencies as low as 60 MHz for some ports found on present-day experients.

31028 **(CONF-860412—8) ICRH coupling in DIII-D.** Hoffman, D.J.; Baity, F.W.; Bryan, W.E.; Jaeger, E.F.; Owens, T.L.; Remsen, D.B.; Luxon, J.; Rawls, J.M. (Oak Ridge National Lab., TN (USA); GA Technologies, Inc., San Diego, CA (USA)). 1986. Contract AC05-84OR21400. 5p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86010016.

From 13. European conference on controlled fusion and plasma heating; Schliersee, F.R. Germany (14 Apr 1986).

A 9-MW ion cyclotron resonant frequency (ICRF) experiment has been proposed to heat the Doublet III-D (DIII-D) plasma. DIII-D is a 2.2-T, 3.5-MA tokamak at GA Technologies with a major radius of 1.67 m and minor radius of 67 cm (elongation ~2). The device was recommissioned in early 1986. The initial experimental program includes ohmic plasma and neutral beam studies; high-power rf experiments will follow in later years. Compact loop antennas (which fit completely in a 35- by 50-cm port) have been chosen to convey this power because of their inherent ease of maintenance, high efficiency, and versatility. In order to verify that the antenna will have sufficient loading, a prototype low-power (2-MW) antenna has been designed and installed. Measurements will be made through September 1986. The antenna is a cavity antenna that will operate from approximately 30 to 80 MHz with a 50-Ω match for a load resistance of ~1 Ω. It is surrounded by a fixed graphite-covered frame and can be extended from 3 cm behind this frame to 2 cm in front. This can be used to adjust coupling to the plasma. The electrical, mechanical, and thermal characteristics of this antenna system (and its extrapolation to ignited tokamaks) are discussed. In addition to experimental exploration of coupling, we have investigated wave propagation and absorption in DIII-D by using a cold collisional plasma model in straight tokamak geometry with rotation transform. Loading and power deposition profiles as a function of frequency, density, and species mix are presented.

31029 **(CONF-860610—19) System studies of compact ignition tokamaks.** Galambos, J.D.; Peng, Y.K.M.; Blackfield, D.T. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007302.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

A new version of the FEDC Tokamak System Code (TSC) has been developed to analyze the Compact Ignition Tokamak (CIT). These proposed experiments have small (major radius F 1.5m) and high magnetic fields (B J 10T), and are characterized by reduced cost. Key design constraints of CIT include limits to the high stress levels in the magnetic coils, limits to the large temperature rises in the coils and on the first wall or divertor plate, minimizing power supply requirements, and assuring adequate plasma performance in fusion ignition and burn time consistent with the latest physics understanding. We present systems code level studies of CIT parameter space here for a range of design options with various design constraints. The present version of the TSC incorporates new models for key components of CIT. For example, new algorithms have been incorporated for calculating stress levels in the TFC and ohmic solenoid, temperature rise in the magnetic coils, peak power requirements, plasma MHD equilibrium and volt-second capability. The code also incorporates a numerical optimizer to find combinations of engineering quantities (device size, coil sizes, coil current densities etc.) and physics quantities (plasma density temperature, and beta, etc.) which satisfy all the constraints and can minimize or maximize a figure of merit (e.g., the major radius). This method was recently used in a mirror reactor system code (3) for the Minimara concept development.

31030 **(CONF-860610—20) Configuration development and structural assessment of the FEDC ignitor concept.** Brown, T.G.; Lee, V.D.; Mayhall, J. (Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400. 3p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007303.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

Emphasis has been placed on the configuration design of the reactor core module and the external, hydraulic preload system. An elevation view of the FEDC Ignitor concept highlighting the reactor core and the external preload system is shown. The reactor core was designed to allow the fit-up of the toroidal field (TF) coils to meet the requirements of TF wedging, bucking (or the combination of both). The TF coil outboard leg was sized to carry its own in-plane loads; the inboard TF leg was sized to carry the residual tension load (after subtracting preload) plus the wedging/bucking loads. Preload is applied directly to the inboard leg at the top of the device, through an insulation compression block. The outboard half of the TF coil is enclosed in a steel case to support out-of-plane loads. In-plane gaps between the coil and case allow in-plane expansion due to thermal and mechanical loads.

31031 (CONF-860610—22) **Maintainability features of the compact ignition tokamak.** Spampinato, P.T.; Bushnell, C.W. (Oak Ridge National Lab., TN (USA); Princeton Univ., NJ (USA). Plasma Physics Lab.). 1986. Contract AC05-84OR21400. 6p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007332.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

The Compact Ignition Tokamak (CIT) is a deuterium-tritium (D-T) device envisaged to be the next experimental reactor in the US Fusion Program. The reactor will initially operate in a nonactivated hydrogen phase for approximately two years. This will permit verification of the integrity of the total system and allow hands-on repair to equipment which has experienced shakedown and early operation failures. Once D-T operations commence, reactor maintenance will require remote handling techniques. An evaluation has been completed to determine what maintenance operations must be performed on the CIT. A maintenance philosophy has been developed which is based upon the use of manipulator systems and robotics in the test cell. Replacement of life-limited equipment will be accomplished using a modular design approach for components, with simple remotely operable interfaces. Examples of operations to be done remotely include: (1) replacing of rf antennae and Faraday shields, (2) uncoupling diagnostic and fueling penetrations, (3) removing of all port covers, and (4) replacing first wall armor tiles, optical mirrors, and vacuum windows.

31032 (CONF-860652—3) **US/JAERI calculational benchmarks for nuclear data and codes intercomparison. Article 8.** Youssef, M.Z.; Jung, J.; Sawan, M.E.; Nakagawa, M.; Mori, T.; Kosako, K. (California Univ., Los Angeles (USA). School of Engineering and Applied Science; Argonne National Lab., IL (USA); Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering; Japan Atomic Energy Research Inst., Tokai, Ibaraki). Jan 1986. Contract AS03-84ER52103;FG03-86ER52124. 8p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009484.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Prior to analyzing the integral experiments performed at the FNS facility at JAERI, both US and JAERI's analysts have agreed upon four calculational benchmark problems proposed by JAERI to intercompare results based on various codes and data base used independently by both countries. To compare codes the same data base is used (ENDF/B-IV). To compare nuclear data libraries, common codes were applied. Some of the benchmarks chosen were geometrically simple and consisted of a single material to clearly identify sources of discrepancies and thus help in analysing the integral experiments.

31033 (CONF-860652—4) **Analysis and intercomparison of Phase I experiments at FNS. Article 9.** Youssef, M.; Gung, C.; Jung, J.; Abdou, M.; Nakagawa, M. (California Univ., Los Angeles (USA). Dept. of Mechanical, Aerospace and Nuclear Engineering; Japan Atomic Energy Research Inst., Tokai, Ibaraki). Jan 1986. Contract AS03-84ER52103;FG03-86ER52124. 11p. NTIS, PC A02/MF A01; GPO Dep. File Number DE86009482.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

Phase I integral experiments of US/JAERI Collaborative Program on Fusion Breeder Neutronics which were carried out at the Fusion Neutron Source (FNS) facility at JAERI ranged from a D-T neutron source characterization experiment, tritium production rate (TPR) measurements in a reference Li_2O assembly, first wall experiments with and without coolant stimulation and beryllium neutron multiplier experiments in various configurations. Phase II experiments for the program (not reported here) are planned to be carried out during FY/86-87 where the system specifications (geometrical arrangement, material selection, etc.) are chosen to give closer situation to the fusion reactor environment (spectra). Both US and JAERI have independently analyzed Phase I experiments using their own data base and codes. Analytical predictions obtained by both countries were compared to measured values. The main objective of the intercomparison is to determine the accuracy, guide the development and establish the validity of present computational methods and nuclear data base in predicting key fusion blanket design parameters (e.g., TPR, heating rate, etc.) and to evaluate the overall uncertainties (both analytical and experimental) associated with these parameters.

31034 (DOE/ER—0045/13, pp 161-169) **Microstructural examination of several commercial alloys neutron irradiated to 100 dpa.** Gelles, D.S. (Westinghouse Hanford Co., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Microstructural examination of ferritic and austenitic commercial alloys neutron irradiated to ~100 dpa confirms that ferritic alloys are very low swelling but precipitate development can be very complex. Austenitic alloys can be very high swelling but no clearly defined microstructural differences could be found between two alloys of similar composition but very different swelling response or between alloys of very different composition but with similar swelling. Differences are ascribed to differences in the onset of swelling. 5 references, 4 figures, 2 tables.

31035 (DOE/ER—0045/13, pp 171-182) **Response of selected high strength high conductivity copper alloys to simulated fusion irradiation and temperature conditions.** Spitznagel, J.A.; Davis, J.W. (Univ. of Pittsburgh, PA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Microstructural changes are reported for a solid solution cold work strengthened alloy (AMZIRC), a precipitation strengthened alloy (Be-Cu) and a dispersion hardened alloy (Al-60) after dual ion irradiation at fluences to ~5 dpa at 450°C and 500°C. The Amzirc and Al-60 alloys are from the same heats being examined by LANL in a EBR-II neutron irradiation program. Void swelling at a level of ~1-5% per dpa is observed in selected areas of the Amzirc alloy that have experienced texture-dependent recovery by dislocation annihilation and rearrangement. Coarsening of the G.P. zones and accelerated precipitate growth are observed in the INESCO supplied Be-Cu alloy. The mechanically alloyed Al-60 is stable and the misfit strains at the interfaces between the Al_2O_3 particles and the Cu matrix are retained. These results are used to extend a proposed test matrix and to suggest (preliminary) alloy modifications for future neutron-irradiation experiments. 14 references, 12 figures, 5 tables.

31036 (DOE/ER—0045/13, pp 183-187) **Effects of neutron irradiation at 450°C and 16 dpa on the properties of various commercial copper alloys.** Brager, H.R.; Heinisch, H.L.; Garner, F.A. (Hanford Engineering Development Lab., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

High-purity copper and eight copper alloys were irradiated to ~16 dpa at ~450°C in the MOTA experiment in FFTF. These alloys were also examined after aging at 400°C for 1000 hours. The radiation-induced changes in the electrical conductivity, tensile properties, and density were measured and compared to those of the aged materials. The changes in conductivity can be either positive or negative depending on the alloy. Changes in tensile properties of most, but not all, of the alloys seem to be primarily dependent on thermal effects rather than the effect of atomic displacements. Radiation at 450°C induced changes in density varying from 0.66% densification to 16.6% swelling. The latter occurred in Cu-O.1% Ag and implies a swelling rate of at least 1%/dpa. 6 references, 3 figures, 2 tables.

31037 (DOE/ER—0045/13, pp 189-195) **Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium.** Tortorelli, P.F.; DeVan, J.H. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The purpose of this task is to determine the corrosion resistance of candidate first-wall materials to slowly flowing lithium in

the presence of a temperature gradient. Corrosion and deposition rates are measured as functions of time, temperature, additions to the lithium, and flow conditions. These measurements are combined with chemical and metallographic examinations of specimen surfaces to establish the mechanisms and rate-controlling processes for dissolution and deposition reactions. Manganese-containing steels (15-30 wt %) experienced substantial corrosion when exposed to thermally convective lithium at 500°C with the 30 wt % Mn steels showing unacceptably high corrosion losses. The mass transfer of 12 Cr-1 MoVW steel at 600°C in lithium was significantly less than that of type 316 stainless steel exposed under similar conditions. 10 references, 8 figures, 1 table.

31038 (DOE/ER—0045/13, pp 196-199) **Corrosion of type 316 stainless steel and 12 Cr-1 MoVW steel in flowing Pb-17 at. % Li.** Tortorelli, P.F.; DeVan, J.H. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The purpose of this task is to determine the corrosion resistance of candidate first-wall materials to slowly flowing Pb-17 at. % Li in the presence of a temperature gradient. Dissolution and deposition rates are measured as functions of time, temperature, and additions to the lead-lithium. These measurements are combined with chemical and metallographic examinations of specimen surfaces to establish the mechanisms and rate-controlling processes for the dissolution and deposition reactions. Type 316 stainless steel and 12 Cr-1 MoVW steel were exposed to Pb-17 at. % Li for about 2000 h at 500°C. Type 316 stainless steel was severely corroded with deep penetration of the alloy by lead-lithium. The 12 Cr-1 MoVW steel did not suffer penetration and corroded uniformly. 5 references, 4 figures.

31039 (DOE/ER—0045/13, pp 200-204) **Environmental effects on properties of structural alloys in flowing lithium.** Chopra, O.K.; Smith, D.L. (Argonne National Lab., IL). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Data on the surface composition of Type 316 stainless steel exposed to lithium under various conditions of time, temperature, and nitrogen content in lithium are presented. The results indicate that the depletion of chromium from the steel depends on the exposure conditions. The depletion of nickel is rapid and independent of temperature and lithium purity. 7 references, 3 figures, 2 tables.

31040 (DOE/ER—0045/13, pp 205-208) **Compatibility of Li_2O in a flowing helium environment.** Chopra, O.K.; Smith, D.L. (Argonne National Lab., IL). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The objective of this task is to evaluate the compatibility of solid breeder materials with structural alloys in a flowing helium environment. The interactions between breeder material, alloys, and gas are investigated as a function of temperature, time, and environmental parameters (e.g., different H_2O and H_2 contents in helium). Reaction rates are determined by measuring the weight change of the breeder material with the alloys as well as the thickness of the reaction scales on the alloys. These measurements, coupled with metallographic evaluation of the alloy surfaces, are used to establish the mechanisms and rate-controlling processes for the corrosion reactions. Sintered Li_2O pellets exposed to flowing helium containing 1 ppm each of H_2O and H_2 show weight losses at 550 and 650°C and a weight gain at 450°C. The rates of weight loss are ~3 orders of magnitude greater than those predicted from equilibrium reaction kinetics. 6 references, 1 figure, 1 table.

31041 (DOE/ER—0045/13, pp 209-213) **Environmental effects on the properties of vanadium-base alloys.** Diercks, D.R.; Smith, D.L. (Argonne National Lab., IL). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Exposures of V-15Cr-5Ti, V-20Ti, and VANSTAR-7 specimens for 2000 h to pressurized flowing water containing 4 ppm dissolved O_2 at 288°C have been completed. Both the V-20Ti and VANSTAR-7 alloys formed nonadherent and nonprotective corrosion products, and both alloys exhibited relatively high corrosion rates. The V-15Cr-5Ti alloy formed a thin adherent film, and its corrosion rate was more than two orders of magnitude lower. Further results obtained in a scanning Auger microprobe study of sulfur segregation in vanadium-base alloys indicate that the extent of intergranular segregation varies markedly with different heats of material. 1 reference, 4 figures, 1 table.

31042 (DOE/ER—0045/13, pp 214-216) **Stress corrosion cracking of PCA - initial considerations and characterization of grain boundary precipitation.** Tortorelli, P.F. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

According to a thermodynamic model of intergranular stress corrosion cracking, Path A Prime Candidate Alloy is predicted to have about the same cracking susceptibility as type 316 stainless steel. However, microstructural manipulation of the PCA alloy may allow improvement in the resistance to sensitization and, therefore, to intergranular stress corrosion cracking. 4 references, 1 figure, 1 table.

31043 (DOE/ER—0045/13, pp 18-19) **Neutronics calculations in support of the ORR-MFE-4A and -4B spectral tailoring experiments.** Lillie, R.A. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The objective of this work is to provide the neutronic design for materials irradiation experiments in the Oak Ridge Research Reactor (ORR). Spectral tailoring to control the fast and thermal fluxes is required to provide the desired displacement and helium production rates in alloys containing nickel. The calculated fluences from the ongoing three-dimensional neutronics calculations are being scaled to agree with experimental data. As of September 30, 1984, this treatment yields 176.2 at. ppm He (not including 2.0 at. ppm He from ^{10}B) and 11.90 dpa for type 316 stainless steel in ORR-MFE-4A and 133.0 at. ppm He and 9.13 dpa in ORR-MFE-4B. 2 references, 2 figures, 1 table.

31044 (DOE/ER—0045/13, pp 20) **Operation of the ORR spectral tailoring experiments (ORR-MFE-4A and ORB-MFE-4B).** Conlin, J.A.; Dudley, I.T. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Experiments ORR-MFE-4A and -4B, which irradiate austenitic stainless steel, use neutron spectral tailoring to achieve the same helium-to-displacement-per-atom (He/dpa) ratio as predicted for fusion reactor first-wall service. Experiment ORR-MFE-4A contains mainly type 316 stainless steel and Path A Prime Candidate Alloy (PCA) and Experiment ORR-MFE-4B similar materials. The specimens contained in the ORR-MFE-4A experiment operated for an equivalent of 986 d at 30 MW reactor power, with temperatures of 400 and 330°C. The specimens contained in the ORR-MFE-4B experiment operated for an equivalent of 787 d at 30 MW reactor power, with temperatures of 500 and 600°C. 8 references.

31045 (DOE/ER—0045/13, pp 21-40) **FFTF fusion irradiations - FFTF cycles 4-6.** Ermi, A.M. (Westinghouse Hanford Co., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Specimens were prepared and loaded into three in-core canisters of the Materials Open Test Assembly (MOTA) for irradiation during FFTF cycle 4 (January-April 1984). Irradiations were conducted at 407°C (6-11 dpa), 518°C (14-16 dpa) and 595°C (14-16 dpa). Alloys emphasized in this initial irradiation were the Path E

ferritic alloys HT-9 and 9Cr-1Mo, and the Path C vanadium alloys. These specimens were either discharged or reinserted into new MOTA hardware for irradiation during FFTF cycles 5-6 (June 1984-June 1985). New specimens were also included, and additional irradiation volume both in-core and below-core was available for an expanded test matrix. Irradiation are currently underway during cycles 5-6 at 365°C (below-core: 4-7 dpa), at 425, 520 and 600°C (all 25-28 dpa) and 600°C (8-14 dpa). Additional emphasis on low activation alloys was given for this irradiation. Specimens in the peak flux positions during cycles 4-6 will accumulate approximately 45 dpa. 3 references, 1 figure, 13 tables.

31046 (DOE/ER—0045/13, pp 41-44) **Test matrices for irradiation of Path A Prime Candidate and developmental alloys in FFTF.** Maziasz, P.J. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

These irradiations are generally intended to evaluate the void swelling resistance of the Path A Prime Candidate Alloy (PCA) at high fluence (>100 dpa) relative to 20%-cold-worked type 316 after side-by-side irradiation in the Fast Flux Test Facility (FFTF), as well as to evaluate the improvements achieved by additional minor compositional variations of the PCA. Further, these irradiations also serve as a low helium base line against which to gage more accurately the effects of higher helium generation for similar irradiation of exactly the same alloys in the High Flux Isotope Reactor (HFIR). An initial set of transmission electron microscopy (TEM) disk specimens was assembled for irradiation at approximately 420, 520, and 600°C to fluences of approximately 15, 45, and 75 dpa. Some TEM specimens were discharged at approximately 9.5 to 15.6 dpa at all temperatures, and additional specimens were then reloaded to achieve fluences well beyond 100 dpa. Tensile specimens were also included in the reload for irradiation in an above-core position at approximately 600°C. The general goals of the experiments are outlined and detailed specimen loadings are described. 9 references, 4 tables.

31047 (DOE/ER—0045/13, pp 45-49) **Reirradiation in FFTF of swelling-resistant Path A alloys previously irradiated in HFIR.** Maziasz, P.J. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Disks of Path A Prime Candidate Alloys (in several pretreatment conditions) and several heats of cold-worked (CW) type 316 and D9 type austenitic stainless steels have been irradiated in HFIR at 300, 500, and 600°C to fluences producing about 10 to 44 dpa and 450 to 3600 at. ppm He. These samples are being reirradiated in the Materials Open Test Assembly (MOTA) in FFTF at 500 and 600°C, together (side by side) with previously unirradiated disks of exactly the same materials, to greater than 100 dpa. These samples many of which have either very fine helium cluster or helium bubble distributions after HFIR irradiation, are intended to test the possibility and magnitude of a helium-induced extension of the initial low-swelling transient regime relative to the void swelling behavior normally found during FFTF irradiation. Further, these samples will reveal the microstructural stability or evolution differences that correlate with such helium effects. 17 references, 4 tables.

31048 (DOE/ER—0045/13, pp 50-52) **Assessment of helium effects on swelling by reirradiation in FFTF of Path A alloys previously irradiated in HFIR.** Maziasz, P.J.; Garner, F.A.; Brager, H.R. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Specimens of the Path A Prime Candidate Alloys and of N-lot SS 316 were irradiated in HFIR at 400 to 600°C to fluences producing approximately 10 to 44 dpa and 500 to 3600 at. ppm He, in both the solution annealed and 20 to 25% cold-worked conditions. The cavity swelling and total microstructural evolution of most samples were observed via transmission electron microscopy on identical disks irradiated side by side in HFIR, and immersion densities were also measured prior to insertion into FFTF/MOTA (Materials Open Test Assembly of the Fast Flux Test Facility). These disks are being irradiated in the FFTF/MOTA (cycles 5 and 6), side by side with disks of the same materials which were not previously irradiated in HFIR. These specimens have been divided into two subsets for discharges after 30 and 60 dpa. 4 references, 1 table.

31049 (DOE/ER—0045/13, pp 53-60) **Miniature tensile test specimens for fusion reactor irradiation studies.** Kluch, R.L. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Three miniature sheet-type tensile specimens and a miniature rod-type specimen are being used to determine irradiated tensile properties for alloy development for fusion reactors. The tensile properties of type 316 stainless steel were determined with these different specimens, and the results were compared. Reasonably good agreement was observed. However, there were differences that led to recommendations on which specimens are preferred. 4 references, 9 figures, 6 tables.

31050 (DOE/ER—0045/13, pp 61-62) **US/Japan collaborative testing program in HFIR and ORR: specimen matrices for HFIR irradiation.** Rowcliffe, A.F.; Grossbeck, M.L.; Tanaka, M.; Jitsukawa, S. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The objective of this program is to investigate the behavior and measure the properties of Japanese and US structural alloys after irradiation in the mixed-spectrum fission reactors Oak Ridge Research Reactor (ORR) and High Flux Isotope Reactor (HFIR). The eight capsules, which constitute phase I of the US/Japan collaboration on HFIR irradiation, were inserted in HFIR on schedule. 1 reference, 6 tables.

31051 (DOE/ER—0045/13, pp 63-65) **Vanadium alloy irradiation test matrix in FFTF.** Braski, D.N. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The goal of this experiment is to determine the effect of neutron irradiation on the tensile properties and microstructure (including swelling behavior) of vanadium alloys. Vanadium specimens of V-15Cr-5Ti, VANSTAR-7, V-3Ti-1Si, and V-20Ti are being irradiated in the FFTF-MOTA experiment. Miniature sheet tensile specimens and transmission electron microscopy (TEM) disks were preimplanted with ^{3}He to levels up to 480 at. ppm using the tritium trick and encapsulated in TZM capsules containing ^{7}Li. The specimens will be irradiated to damage levels up to 165 dpa with irradiation temperatures of 420, 520, and 600°C. All of the capsules at 600°C underwent a temperature excursion during their initial cycle and had to be replaced. 2 references, 1 figure, 3 tables.

31052 (DOE/ER—0045/13, pp 66-67) **Irradiation experiments for the US/Japan collaborative testing program in HFIR and ORR.** Conlin, J.A.; Woods, J.W. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The experiments in the US/Japan collaborative testing program for High Flux Isotope Reactor (HFIR) and Oak Ridge Research Reactor (ORR) irradiate austenitic stainless steel candidate alloys for use as first-wall and blanket structural materials in fusion reactors. They will be irradiated with mixed-spectrum neutrons and with spectral tailoring to achieve helium-to-displacement-per-atom (He/dpa) ratios predicted for fusion reactor service. The assembly of all eight capsules, HFIR JP-1 through JP-8, was completed, and they are now being irradiated. The parts fabrication assembly and flow testing of the prototype ORR capsules for 60°C and 200°C

MFE6-J were completed and the capsule was inserted in the ORR. Performance was satisfactory in all respects. 1 reference, 1 figure.

31053 (DOE/ER—0045/13, pp 69-75) **Development of austenitic steel for fast induced-radioactivity decay.** Klueh, R.L.; Maziasz, P.J. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

During the operation of a fusion reactor, the structural material of the first wall and blanket structure will become highly radioactive from activation by the fusion neutrons. Disposal of this material after the service lifetime will be a difficult radioactive waste management problem. One way to minimize the disposal problem is to use structural materials in which radioactive isotopes induced by irradiation decay quickly to levels that allow simplified disposal techniques. The feasibility of developing such austenitic stainless steels is being assessed. A program was started to develop austenitic steels for fusion reactors in which the induced radioactivity decays to low levels in a reasonable time. Ten small button heats of Fe-Cr-Mn-C alloys were melted, cast, and rolled. After various heat treatments, optical microscopy studies and magnetic measurements were used to assess the microstructural constituents present. 6 references, 6 figures, 5 tables.

31054 (DOE/ER—0045/13, pp 76-80) **Swelling behavior of titanium-modified alloys in EBR-II.** Garner, F.A.; Brager, H.R.; Puigh, R.J. (Hanford Engineering Development Lab., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

It appears that titanium additions to stainless steels covering a wide compositional range around the specifications of AISI 316 results only in an increased delay period before neutron-induced void swelling proceeds. Once swelling is initiated the post-transient behavior of both annealed and cold-worked titanium-modified steels is quite consistent with that of AISI 316, approaching a relatively temperature-independent swelling rate of ~1% per dpa. 14 references, 5 figures.

31055 (DOE/ER—0045/13, pp 81-82) **Swelling of Fe-Cr-Mn ternary alloys in FFTF.** Brager, H.R.; Garner, F.A. (Hanford Engineering Development Lab., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The object of this effort is to determine those factors that control the swelling of alloy systems that have the potential for reduced activation. The swelling of eight simple Fe-Mn binary and Fe-Cr-Mn ternary alloys was measured by an immersion density technique after irradiation at ~520°C to 3.2 x 10^{22} n/cm², E > 0.1 MeV, or ~15 dpa. The swelling of these alloys decreases with manganese but exhibits a dependence on manganese content that is weaker than that of nickel in Fe-Cr-Ni alloys. The dependence on chromium is even weaker, in sharp contrast to the behavior observed in Fe-Cr-Ni alloys. The addition of other solutes also decreases the swelling. 2 references, 2 figures, 1 table.

31056 (DOE/ER—0045/13, pp 85-90) **Solute segregation and void formation in ion-irradiated vanadium-base alloys.** Loomis, B.A.; Smith, D.L. (Argonne National Lab., IL). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The radiation-induced segregation of solute atoms in the V-15Cr-5Ti alloys was determined after either single- dual-, or helium implantation followed by single-ion irradiation at 725°C to radiation damage levels ranging from 103 to 169 dpa. Also, the effect of irradiation temperature (600-750°C) on the microstructure in the V-15Cr-5Ti alloy was determined after single-ion irradiation to 200 and 300 dpa. The solute segregation results for the single- and dual-ion irradiated alloy showed that the simultaneous production of irradiation damage and deposition of helium resulted in enhanced depletion of Cr solute and enrichment of Ti, C and S solute in the near-surface layers of irradiated specimens. The observations of the irradiation-damaged microstructures in V-15Cr-5Ti specimens showed an absence of voids for irradiations of the alloy at 600-750°C to 200 dpa and at 725°C to 300 dpa. The principle effect on the microstructure of these irradiations was to induce the formation of a high density of disc-like precipitates in the vicinity of grain boundaries and intrinsic precipitates and on the dislocation structure. 8 references, 4 figures.

31057 (DOE/ER—0045/13, pp 91-94) **Radiation effects in vanadium alloys in fusion reactor environments.** Kumar, A.; Mattas, R.F. (Argonne National Lab., IL). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The objective of this work is to provide guidance on the applicability of vanadium-base alloys for structural components in a fusion reactor. The swelling behavior of neutron irradiated vanadium was modeled to establish the theoretical limits for swelling. Void and dislocation sink strengths along with the net bias factors for vacancies and interstitials were calculated. These factors were combined to predict the maximum steady state swelling rate. The maximum rate is predicted to be about 0.2%/dpa, which is close to the value calculated for ferritic steels and about a factor of seven lower than for austenitic stainless steels. This value is also consistent with the limited irradiation data for vanadium. 11 references, 1 table.

31058 (DOE/ER—0045/13, pp 95-98) **Effect of helium on the tensile properties of several vanadium alloys.** Braski, D.N. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Specimens of three vanadium alloys were implanted with different levels of ^{3}He using the tritium trick and subsequently tensile tested at elevated temperatures. The V-15Cr-5Ti and V-3Ti-1Si specimens were embrittled by ^{3}He at a level of 150 at. ppm while the VANSTAR-7 specimens were not. The embrittlement appeared to be caused by extensive ^{3}He bubble networks and possibly precipitate particles on the grain boundaries; hopefully the bubble distribution can be changed (for better simulation) by altering parameters of the tritium trick. The results of the investigation also show that the embrittlement resistance of vanadium alloys can be improved by adjustment of their composition and/or microstructure. 1 reference, 4 figures, 1 table.

31059 (DOE/ER—0045/13, pp 99-103) **Tensile properties of helium-injected V-15Cr-5Ti after irradiation in EBR-II.** Grossbeck, M.L.; Horak, J.A. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Miniature specimens of V-15Cr-5Ti were prepared in the annealed condition and with 10, 20, and 30% cold work. The annealed specimens were cyclotron injected with helium and irradiated in sodium in EBR-II. The cold-worked specimens were irradiated in EBR-II but not helium injected. The specimens were irradiated at 400, 525, 625, and 700°C and received a fluence of 4.1 to 5.5 x 10^{26} neutrons/m² (E > 0.1 meV). Tensile testing revealed very significant embrittlement as a result of the neutron irradiation but a much smaller change, mostly at 400°C, resulting from helium injection. 5 references, 9 figures, 2 tables.

31060 (DOE/ER—0045/13, pp 106-119) **Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22}n/cm².** Hu, W.L. (Westinghouse Hanford Co., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Charpy impact tests on specimens in the AD-2 reconstitution experiment were completed. One hundred ten specimens made of HT-9 base metal, 9Cr-1Mo base metal and 9Cr-1Mo weldment at various heat treatment conditions were tested in temperature range from -73°C to 260°C. The specimens were irradiated from 390°C

to 550°C and the fluence of the specimens reached 6 x 10^{22} n/cm^2. This is the first time that the transition behavior of ferritic alloys at high fluence was obtained. This is also the first time that comprehensive results on the irradiated 9Cr-1Mo weldment are available. The test results show a small additional shift in transition temperature for HT-9 base metal irradiated at 390°C and 450°C as the fluence was raised to 6 x 10^{22} n/cm^2. At higher irradiation temperatures, however, the shift in transition temperature is less conclusive. Further reduction in USE was observed at higher fluence for all the irradiation temperatures. There is no apparent fluence effect for 9Cr-1Mo base metal at all the irradiation temperatures studied. Contrary to the previous finding on HT-9 base metal and weldment, the 9Cr-1Mo weldment shows a higher transition temperature (+ 60°C) and a higher USE (+ 100%) as compared to the 9Cr-1MO base metal for the same irradiation conditions. 6 references, 7 figures, 7 tables.

31061 (DOE/ER—0045/13, pp 120-127) **Effect of nickel content on the aging and irradiation response of impact properties of 9 Cr-1 MoVNb and 12 Cr-1 MoVW in the absence of internal helium effects.** Corwin, W.R.; Vitek, J.M.; Klueh, R.L. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The objectives of this study are to provide information on the radiation-induced degradation of impact properties of high chromium ferritic steels at moderate irradiation doses. It concurrently examines the viability of simulating helium effects in these engineering alloys by adding nickel and irradiation in a mixed spectrum reactor. Impact testing was completed on aged and EBR-II irradiated 9 Cr-1 MoVNb and 12 Cr-1 MoVW steels, each with and without small additions of nickel. Only limited property changes resulted from aging or irradiating to 12 dpa in the temperature range of 450°C to 550°C. Irradiation of the 12 Cr-1 MoVW at 390°C with and without nickel produced severe degradation of impact properties. Nickel additions affected the unirradiated material properties, but subsequent radiation-induced changes were similar regardless of nickel content. 7 references, 12 figures, 4 tables.

31062 (DOE/ER—0045/13, pp 128-140) **Effects of irradiation on low activation ferritic alloys.** Gelles, D.S.; Hamilton, M.L. (Hanford Engineering Development Lab., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

A series of low activation ferritic alloys was designed, fabricated, irradiated in MOTA 1B, and tested and examined following irradiation. The series consists of alloys similar to 2-1/4Cr-1Mo with vanadium substituted for molybdenum, alloys similar to 9Cr-1Mo with tungsten and/or vanadium substituted for molybdenum and alloys similar to HT-9 with tungsten and/or vanadium substituted for molybdenum. The results demonstrate that low-activation alloys can be successfully produced in the ferritic alloy class. The 2-1/4Cr-V alloys developed excessive irradiation hardening due to precipitation following irradiation at 420°C and the 2-1/4Cr-V and 9Cr-V/W alloys developed excessive softening due to precipitate coarsening and dislocation recovery following irradiation at 585°C. In comparison, the 12Cr-W-V alloy appears to have excellent properties; α' precipitation at 420°C in-reactor did not significantly increase strength and reasonable strength was maintained after irradiation at 585°C probably in part due to intermetallic precipitate development. 11 references, 7 figures, 3 tables.

31063 (DOE/ER—0045/13, pp 141-146) **Development of ferritic steels for fast induced-radioactivity decay.** Klueh, R.L.; Vitek, J.M. (Oak Ridge National Lab., TN). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Tempering studies were conducted on eight heats of normalized chromium-tungsten steel that contained variations in the composition of chromium, tungsten, vanadium, and tantalum. Hardness measurements and optical metallographic observations were used to determine alloying effects on tempering resistance between 650 to 780°C. The results were compared to results for analogous chromium-molybdenum steels. 6 references, 6 figures, 1 table.

31064 (DOE/ER—0045/13, pp 147-151) **Rapid solidification of candidate ferritic steels.** Megusar, J.; Craven, C.A.; Kohse, G.; Runkle, J.; Harling, O.K.; Grant, N.J. (Massachusetts Institute of Technology and Industrial Materials Technology). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

The objective of this work is to evaluate the potential of rapid solidification (RS) on the refinement of the microstructure and the potential for lowering irradiation-induced shifts in the ductile-to-brittle transition temperature (DBTT) in the Candidate Ferritic Steels. HT-9 and 9Cr-1Mo steels were rapidly solidified by the liquid dynamic compaction (LDC) process and 2-1/4Cr-1Mo steel was prepared by the ultrasonic gas atomization (USGA) process. The consolidation was performed in the ferritic temperature range in order to minimize segregation. These alloys will be tested at ORNL using 1/3 CVN test specimens and the results will be compared with those for conventionally processed alloys. 6 references, 7 figures, 2 tables.

31065 (DOE/ER—0045/13, pp 152-155) **Poisson's ratio measurements for martensitic stainless steels.** Gelles, D.S. (Westinghouse Hanford Co., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Poisson's ratio measurements using an ultrasonic technique over the temperature range room temperature to 600°C are reported for HT-9. As much as a 0.1 variation is found as a result of specimen orientation. However, based on comparisons from the literature, it is concluded that such variations are common and are not due to orientation effects. Further measurements will be needed before a design equation for the MHFES can be generated. 6 references, 3 tables.

31066 (DOE/ER—0045/13, pp 156-160) **Effects of irradiation on the fracture toughness of HT-9.** Huang, F.H. (Westinghouse Hanford Co., Richland, WA). Mar 1985. NTIS, PC A11/MF A01. File Number DE85010454.

In Alloy development for irradiation performance. Semiannual progress report for period ending September 30, 1984.

Compact tension specimens of HT-9 irradiated at 390, 450 and 500°C were tested at 90, 205 and 450°C. Test results showed that both test and irradiation temperatures have insignificant effects on the fracture toughness of HT-9. However, the tearing modulus increases substantially with increasing irradiation temperature. In addition, the toughness of HT-9 at 205°C where a thoroughness trough was observed for unirradiated HT-9 remained unchanged after irradiation to a fluence of 5.5 x 10^{22} n/cm^2. 3 references, 6 figures, 1 table.

31067 (DOE/ER—0113/5) **Eighth annual progress report on special purpose materials for magnetically confined fusion reactors.** (USDOE Office of Energy Research, Washington, DC. Development and Technology Div.; Oak Ridge National Lab., TN (USA)). Mar 1986. Contract AC05-84OR21400. 53p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86010065.

Separate abstracts have been prepared for eight of the included sections. (MOW)

31068 (DOE/OR/21400—T239) **Compact ignition tokamak design studies: design and analysis listing and examples. Documentation listing.** Flanagan, C.A. (Oak Ridge National Lab., TN (USA)). 20 Jan 1986. Contract AC05-84OR21400. 90p. NTIS MF A01; 2; GPO Dep. File Number DE86007325.

A list of the viewgraphs presented to the Ignition Technical Oversight Committee is given. (MOW)

31069 **(GA-A—18388) Physics analysis database for the DIII-D tokamak.** Schissel, D.P.; Bramson, G.; DeBoo, J.C. (GA Technologies, Inc., San Diego, CA (USA)). Mar 1986. Contract AC03-84ER51044. 13p. (CONF-860324—25). NTIS, PC A02/MF A01; GPO Dep. File Number DE86010216.

From High temperature plasma diagnostics; Hilton Head Island, SC, USA (9 Mar 1986).

Centralized databases for handling reduced data for physics analysis have been implemented for the DIII-D tokamak. Each database record corresponds to a specific snapshot in time for a selected discharge. Features of the database environment include automatic updating, data integrity checks, and data traceability. Reduced data from each diagnostic comprises a dedicated dataset (a subset of the database) with quality assurance provided by a physicist. For the confinement database, these datasets will be used to create profile datasets which will be input to a transport code to create a transport dataset. The databases are implemented on a Digital Equipment Corporation VAX 8600 running VMS. The database management system is S1032 from Software House, Inc.

31070 (IPPJ—678, pp 226-248) **Comparative study of free electron laser experiments in longitudinal and transverse wiggler geometries.** Kawasaki, S.; Hirose, K.; Kamada, K.; Masuzaki, M.; Kubota, Y. (Kanazawa Univ., Japan. Faculty of Science). May 1984. NTIS (US Sales Only), PC A13/MF A01. File Number DE86780446. (CONF-8311280—).

From Collaborating research meeting on particle-beam applications to fusion research; Nagoya, Japan (21 Nov 1983).

Experiments of intense electromagnetic wave generation in the frequency range of cm-mm microwave are carried out on the basis of the interactions of an IREB and various structures surrounding the beam. The results of the recent study using an IREB (particle energy of 0.6 MeV, peak intensity of 10 kA and 10 ns duration) in the regimes of collective Raman FEL and electron cyclotron maser in the axially periodic and transverse wigglers are described and discussed briefly. An intense radiation of 20-25 GHz is observed in a considerably narrow range of the guide magnetic field and reasonably attributed to ECM mechanism. Although the effect of the wiggler field on the frequency spectrum of the generated e.m. waves is clearly seen, no distinct Raman FEL radiation is identified in any geometry. Compared with a simple linear theory it is found that the identification and the determination of the detected radiation modes are of crucial importance especially under the effect of the strong axial uniform magnetic field imposed to keep the macroscopic stability of the REB. More exquisite diagnostics of the IREB parameters are needed to get a better coincidence with the theoretical predictions.

31071 (IPPJ—678, pp 30-39) **Equation of state for fuel and target implosion.** Arai, Masaru; Kawata, Shigeo; Niu, Keishiro. (Tokyo Inst. of Tech., Japan). May 1984. NTIS (US Sales Only), PC A13/MF A01. File Number DE86780446. (CONF-8311280—).

From Collaborating research meeting on particle-beam applications to fusion research; Nagoya, Japan (21 Nov 1983).

In order to achieve target implosion of inertial confinement fusion, it is necessary to change the state of DT fuel from a cryogenic solid state to an extremely high density and a high temperature state. In this implosion process, the equation of state between these macroscopic values plays an important role. The data of Sesame E.O.S. Library are adopted for the equation of state, and the simulation calculation for target implosion is performed with a one-dimensional hydrodynamic simulation code. Comparison between the case using these data and one using equation of state for ideal gas is also done.

31072 (IPPJ—678, pp 52-79) **Effect of nonuniform implosion of target on fusion parameters.** Kawata, Shigeo; Niu, Keishiro. (Tokyo Inst. of Tech., Japan). May 1984. NTIS (US Sales Only), PC A13/MF A01. File Number DE86780446. (CONF-8311280—).

From Collaborating research meeting on particle-beam applications to fusion research; Nagoya, Japan (21 Nov 1983).

The effect of the nonuniform implosion of the ICF target on the fusion parameters is investigated numerically. The numerical analysis is carried out by using a three-dimensional particle in cell code with sliding grids. The numerical results show that the nonuniformity of the implosion acceleration is required to be less than a few percent for a pellet of reactor size.

31073 (IPPJ—678, pp 80-94) **Simulation of LIB target implosion.** Nagata, Norimasa; Kawata, Shigeo; Niu, Keishiro. (Tokyo Inst. of Tech., Japan). May 1984. NTIS (US Sales Only), PC A13/MF A01. File Number DE86780446. (CONF-8311280—).

From Collaborating research meeting on particle-beam applications to fusion research; Nagoya, Japan (21 Nov 1983).

A one-dimensional hydrodynamic simulation code for the analysis of the target implosion used in LIB-ICF which includes the various effects has been developed. This code includes some effects concerned with the incident particle beam. These effects decrease the implosion velocity and the implosion efficiency. So the energy deposition profile of the incident particle beam must always be considered exactly in the target design for LIB-ICF.

31074 **(LA-UR—86-641) Prospects for improved fusion reactors.** Krakowski, R.A.; Miller, R.L.; Hagenson, R.L. (Los Alamos National Lab., NM (USA); Phillips Petroleum Co., Bartlesville, OK (USA)). 1986. Contract W-7405-ENG-36. 10p. (CONF-860603—5). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86007377.

From 4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair; Geneva, Switzerland (1 Jun 1986).

Ideally, a new energy source must be capable of displacing old energy sources while providing both economic opportunities and enhanced environmental benefits. The attraction of an essentially unlimited fuel supply has generated a strong impetus to develop advanced fission breeders and, even more strongly, the exploitation of nuclear fusion. Both fission and fusion systems trade a reduced fuel charge for a more capital-intensive plant needed to utilize a cheaper and more abundant fuel. Results from early conceptual designs of fusion power plants, however, indicated a capital intensiveness that could override cost savings promised by an inexpensive fuel cycle. Early warnings of these problems appeared, and generalized routes to more economically attractive systems have been suggested; specific examples have also recently been given. Although a direct reduction in the cost (and mass) of the fusion power core (FPC, i.e., plasma chamber, first wall, blanket, shield, coils, and primary structure) most directly reduces the overall cost of fusion power, with the mass power density (MPD, ratio of net electric power to FPC mass, kWe/tonne) being suggested as a figure-of-merit in this respect, other technical, safety/environmental, and institutional issues also enter into the definition of and direction for improved fusion concepts. These latter issues and related tradeoffs are discussed.

31075 **(LA-UR—86-679) Interstitial dislocation loop nucleation and growth and swelling produced by high-energy cascades.** Yu, J.; Sommer, W.F.; Bradbury, J.N. (Los Alamos National Lab., NM (USA); Academia Sinica, Beijing (China). Inst. of Atomic Energy). 1986. Contract W-7405-ENG-36. 38p. (CONF-860605—5). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86007374.

From 13. international symposium on the effects of radiation on materials; Seattle, WA, USA (23 Jun 1986).

Structural materials for advanced energy sources such as magnetically-and inertially-confined thermonuclear reactors are subjected to a radiation enviornment that produces high-energy displacement cascades and transmutation products that include helium. We address these characteristics and formulate their effect on the microstructural evolution of a material. We consider that, immediately after a high energy cascade event, a vacancy-rich region exists near the primary event site and that an interstitial-rich zone, formed by collision chains, exists some distance from the primary event site. Transmutation-product helium can diffuse into the vacancy-rich zone and stabilize bubble nuclei that will later grow if sufficient vacancies and helium atoms diffuse to the nucleus. These bubbles are the sinks for excess radiation-produced vacancies. The excess radiation-produced interstitials migrate and bond; if the binding energy is high eneough, a di-interstitial is considered to be a stable dislocation-loop nucleus. The loop nuclei grow if they re-

ceive more interstitials than vacancies; this represents material swelling since the bubbles do not cause a lattice contraction to offset the dilation caused by the growing dislocation loops.

31076 **(LA-UR—86-1386) Directions for improved fusion reactors.** Krakowski, R.A.; Miller, R.L.; Delene, J.G. (Los Alamos National Lab., NM (USA); Oak Ridge National Lab., TN (USA)). 1986. Contract AC05-84OR21400;W-7405-ENG-36. 18p. (CONF-860551—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86010195.

From Technical meeting and workshop on fusion reactor design and technology; Yalta, USSR (26 May 1986).

Conceptual fusion reactor studies over the past 10 to 15 years have projected systems that may be too large, complex, and costly to be of commercial interest. One main direction for improved fusion reactors points towards smaller, higher-power-density approaches. First-order economic issues (i.e., unit direct cost and cost of electricity) are used to support the need for more compact fusion reactors. A generic fusion physics/engineering/costing model is used to provide a quantiative basis for these arguments for specific fusion concepts.

31077 **(LBL—21174) Muon catalyzed fusion.** Breunlich, W.H.; Cargnelli, M.; Marton, J.; Naegele, N.; Pawlek, P.; Scrinzi, A.; Werner, J.; Zmeskal, J.; Bistirlich, J.; Crowe, K.M. (Lawrence Berkeley Lab., CA (USA); Oesterreichische Akademie der Wissenschaften, Vienna; Los Alamos National Lab., NM (USA); Technische Univ. Muenchen, Garching (Germany, F.R.). Physikdepartment). Jan 1986. Contract AC03-76SF00098. 16p. (CONF-860166—3). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009921.

From Workshop on fundamental muon physics: atoms, nuclei, and particles; Los Alamos, NM, USA (20 Jan 1986).

This paper presents an overview of the program and results of our experiment performed by a European-American collatoration at the Swiss Institute of Nuclear Research. Systematic investigations of the low temperature region (23K to 300K) reveal a surprisingly rich physics of mesoatomic and mesomolecular processes, unparalleled in other systems of isotopic hydrogen mixtures. A dramatic density dependence of the reaction rates is found. The rich structure in the time spectra of the fusion neutrons observed at low gas density yields first evidence for new effects, most likely strong contributions from reactions of hot muonic atoms. The important question of muon losses due to He sticking is investigated by different methods and over a wide range of tritium concentrations.

31078 **(PPPL—2270) Model for electron cooling by radiation losses in plasmas: application to soft x-ray laser development.** Skinner, C.H.; Keane, C. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1986. Contract AC02-76CH03073. 12p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009751.

We present a simple model which may be used to evaluate the suitability of different ions for rapid plasma cooling by line radiation in recombination pumped x-ray laser schemes.

31079 **(PPPL—2320) Numerical determination of the magnetic field line Hamiltonian.** Kuo-Petravic, G.; Boozer, A.H. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Mar 1986. Contract AC02-76CH03073. 33p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009749.

The structure of a magnetic field is determined by a one-degree of freedom, time-dependent Hamiltonian. This Hamiltonian is evaluated for a given field in a perturbed action-angle form. The location and the size of magnetic islands in the given field are determined from Hamiltonian perturbation theory and from an ordinary Poincare plot of the field line trajectories.

31080 **(SAND—86-0017C) Improved shielding calculations for the particle beam fusion accelerator PBFA II.** Sweeney, M.A.; Halbleib, J.A.; Tolk, K.M. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 6p. (CONF-860652—1). NTIS, PC A02/MF A01; GPO Dep. File Number DE86004988.

From 7. topical meeting on the technology of fusion energy; Reno, NV, USA (15 Jun 1986).

PBFA II is a 36-module particle beam fusion accelerator at Sandia National Laboratories that became operational in December 1985. A cutaway drawing of the accelerator is shown. The accelerator has about 3.5 times the energy and power of PBFA I, a 36-module accelerator in operation since June 1980. The most significant difference between the two accelerators, however, is the much higher machine voltage on PBFA II (30 MV instead of 2 MV). The 30-MV voltage will facilitate focusing of heavier ions, such as lithium and carbon, to a fusion target. Some shielding considerations are described.

31081 **(SAND—86-0057C) Evaluation of cooling channel configurations for actively cooled limiters.** Koski, J.A.; Whitley, J.B. (Sandia National Labs., Albuquerque, NM (USA)). 1986. Contract AC04-76DP00789. 6p. (CONF-860610—26). NTIS, PC A02/MF A01; GPO Dep. File Number DE86008780.

From American Nuclear Society annual meeting; Reno, NV, USA (15 Jun 1986).

The Sandia electron beam test system (EBTS) was used to heat one side of 7.7 mm and 12.7 mm inside diameter copper tubes. A single tube placed horizontally in the EBTS vacuum chamber was heated on the top by a rastered 30 kV electron beam. The test section was cooled with water supplied by a centrifugal pumped closed loop system. Coolant inlet and exit pressures, flow rate, inlet temperature and temperature rise were measured as were the target's surface and backside temperatures. Water calorimetry was used to determine the actual delivered power, with all system operation and data collection under computer control. The flow within the heated region was studied by viewing directly through the tube.

31082 **(UCRL—93834-Rev.1) Determining plasma-fueling sources with an end-loss ion spectrometer. Revision 1.** Grubb, D.P.; Foote, J.H. (Lawrence Livermore National Lab., CA (USA)). 4 Mar 1986. Contract W-7405-ENG-48. 15p. (CONF-860324—2-Rev.1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009386.

From High temperature plasma diagnostics; Hilton Head Island, SC, USA (9 Mar 1986).

To help identify the major sources of fueling gas in Tandem Mirror Experiment-Upgrade (TMX-U), we mounted a mass-sensitive, E parallel B, end-loss ion spectrometer (ELIS) near the machine's centerline. We set the electric field in the ELIS to simultaneously measure the axial loss currents of both hydrogen and deuterium. We then initiated plasma discharges, where we injected either hydrogen or deuterium gas into the central cell. We also selected and deselected the central-cell neutral beams that were fueled with hydrogen gas. The end-cell neutral beams were always selected and fueled with deuterium. By taking the ratio of the hydrogen end-loss current to the deuterium end-loss current (with a known deuterium-gas feed rate), we were able to infer the effective fueling rates that were due to wall reflux, central-cell beams, and end-cell beams. The results were the following: wall reflux, 6 Torr x l/s; central-cell beams, 15 Torr x l/s; and end-cell beams 1 Torr x l/s.

31083 **(UCRL—93950) Coatings for high energy applications. The Nova laser.** Wirtenson, G.R. (Lawrence Livermore National Lab., CA (USA)). 1986. Contract W-7405-ENG-48. 35p. (CONF-860117—8). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009407.

From Los Angeles symposium and exhibition on optical and electro-optical engineering; Los Angeles, CA, USA (19 Jan 1986).

The combined requirements of energy density, multiple wavelength, and aperture make the coatings for the Nova Inertial Confinement Fusion (ICF) laser unique. This ten beam neodymium glass laser system, built at the Lawrence Livermore National Laboratory (LLNL), has over a thousand major optical components; some larger than one meter in diameter and weighing 380 Kg. The laser operates at 1054 nm and can be frequency doubled to 527 nm or tripled to 351 nm by means of full aperture potassium dihydrogen phosphate (KDP) crystal arrays. The 1.0 nsec fluence varies along the laser chain, sometimes reaching values as high as 16 J/cm^2 at the input lens to one of the spatial filters. The design specifications of this massive optical system were changed several times as

the state-of-the-art advanced. Each change required redesign of the optical coatings even as vendors were preparing for production runs. Frequency conversion to include shorter wavelengths mandated the first major coating redesign and was followed almost immediately by a second redesign to reduce solarization effects in borosilicate crown glass. The conventional thermal evaporation process although successful for the deposition of mirror coatings, was not able to produce antireflection coatings able to survive the locally high chain fluences. As a consequence it became necessary to develop another technique. Solution produced coatings were developed having transmissions exceeding 99% per part and damage threshold values equal to the bare substrate. The unique requirement of the Nova laser necessitated special deposition and metrology equipment. These programmatic developments will be reviewed in the context of the cooperative working relationship developed between LLNL and its vendors. It was this excellent relationship which has enabled LLNL to obtain these highly specialized coatings for the Nova laser.

31084 **(UCRL—94286) Expert system to control a fusion energy experiment.** Johnson, R.R.; Canales, T.; Lager, D. (Lawrence Livermore National Lab., CA (USA)). 1986. Contract W-7405-ENG-48. 8p. (CONF-860638—4). NTIS, PC A02. File Number DE86009720.

From American control conference; Seattle, WA, USA (18 Jun 1986).

This paper describes a system that automates neutral beam source conditioning. The system achieves this with artificial intelligence techniques by encoding the behavior of several experts as a set of if-then rules in an expert system. One of the functions of the expert system is to control an adaptive controller that, in turn, controls the neutral beam source. The architecture of the system is presented followed by a description of its performance.

31085 **Cost assessment of a generic magnetic fusion reactor.** Sheffield, J.; Dory, R.A.; Cohn, S.M.; Delene, J.G.; Parsly, L.; Ashby, D.E.T.F.; Reiersen, W.T. (Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37831). *Fusion Technology;* 9: No. 2, vp(Mar 1986). Contract AC05-84OR21400.

A generic reactor model is used to examine the economic viability of electricity generation by magnetic fusion. The simple model uses components that are representative of those used in previous reactor studies of deuterium-tritium burning tokamaks, stellarators, Bumpy Tori, reversed-field pinches, and tandem mirrors. Conservative costing assumptions are made. The generic reactor is not a tokamak but rather it is intended to emphasize what is common to all magnetic fusion reactors. The reactor uses a superconducting toroidal coil set to produce the dominant magnetic field. To this extent, it is not as good an approximation to systems, such as the reversed-field pinch, in which the main field is produced by a plasma current. The main output of the study is the cost of electricity as a function of the weight and size of the fusion core - blanket, shield, structure, and coils. The model shows that a 1200-MW (electric) power plant with a fusion core weight of approx. = 10,000 tonnes should be competitive in the future with fission and fossil plants. Sensitivity studies that vary the assumptions show that this result is not sensitively dependent on any given assumption. Of particular importance is the result that this scale of fusion reactor may be realized with only moderate advances in physics and technology capabilities.

31086 **Deuterium-tritium fuel self-sufficiency in fusion reactors.** Abdou, M.A.; Vold, E.L.; Gung, C.Y.; Youssef, M.Z.; Shin, K. (University of California at Los Angeles, School of Engineering and Applied Science, Department of Mechanical, Aerospace and Nuclear Engineering, Los Angeles, CA 90024). *Fusion Technology;* 9: No. 2, vp(Mar 1986).

Conditions necessary to achieve deuterium-tritium fuel self-sufficiency in fusion reactors are derived through extensive modeling and calculations of the required and achievable tritium breeding ratios as functions of the many reactor parameters and candidate design concepts. It is found that the excess margin in the breeding potential is not sufficient to cover all present uncertainties. Thus, the goal of attaining fuel self-sufficiency significantly restricts the allowable parameter space and design concepts. For example, the required breeding ratio can be reduced by (A) attaining high tritium fractional burnup, >5%, in the plasma, (B) achieving very high reliability, >99%, and very short times, <1 day, to fix failures in the tritium processing system, and (C) ensuring that nonradioactive decay losses from all subsystems are extremely low, e.g., <0.1% for the plasma exhaust processing system. The uncertainties due to nuclear data and calculational methods are found to be significant, but they are substantially smaller than those due to uncertainties in system definition.

31087 **Uncertainties in prediction of tritium breeding in candidate blanket designs due to present uncertainties in nuclear data base.** Youssef, M.Z.; Abdou, M.A. (University of California School of Engineering and Applied Science, Department of Mechanical, Aerospace, and Nuclear Engineering, Los Angeles, CA 90024). *Fusion Technology;* 9: No. 2, vp(Mar 1986). Contract AA03-76SF00034.

Estimates of the uncertainty Δ/sub D/ in predicting the achievable tritium breeding ration (TBR) due to the uncertainties in nuclear data base are presented for several fusion blanket concepts. Specifically, the impact of the current uncertainties in measuring basic nuclear data on the calculated TBR is analyzed and discussed for four leading blanket designs that utilize different breeding materials, namely, Li_2O, 17Li-83Pb, $LiAlO_2$, and flibe. The impact on the TBR values of various evaluations for beryllium, which is employed as a multiplier in the latter two blankets, has been studied. Estimates for Δ/sub D/ in other blanket concepts have also been assessed. Moreover, estimates have been made, based on previous studies, for the contribution to Δ/sub D/ introduced by using neutron cross-section libraries that have different group structure and weighting spectra. Based on statistically incorporating the present cross-section uncertainties and their correlation in the analysis, the range of the uncertainty in TBR was found to be between 2 and 6% in all the concepts considered. The nonstatistical treatment for cross-section errors tends to give larger values for Δ/sub D/. The uncertainty in TBR introduced by misrepresenting the secondary energy-angle distribution of the $^9Be(n,2n')$ cross-section ranges from approx. =4% in the flibe to approx. =2% in the $LiAlO_2$ blanket. Uncertainty up to approx. =15% can be encountered in the TBR evaluation in thin blankets with natural ^6Li enrichment if broad-group cross-section libraries are used. However, this uncertainty can be reduced upon using an appropriate weighting spetrum representative of the one found in these blankets type.

31088 **An assessment of tritium breeding requirements based on the tritium fuel cycle.** Jung, J. (Argonne National Laboratory, Fusion Power Program 9700 South Cass Avenue, Argonne, IL 60439). *Fusion Technology;* 9: No. 2, vp(Mar 1986).

An assessment of tritium breeding requirements for fusion power reactors is presented. The analysis is based on an evaluation of time-dependent tritium inventories in the reactor system. The method presented can be applied to any fusion systems operating in a steady-state mode as well as in a pulsed mode. As an example, the UWMAK-I design was analyzed and it has been found that the start-up inventory requirement calculated by the present method significantly differs from those previously calculated. The effect of reactor parameter changes on the required tritium breeding ratio is also analyzed for a variety of reactor operation scenarios. A FORTRAN-IV Computer Program, the JET-I code, has been developed to implement the present method. It is now in operation on the Argonne National Laboratory IBM-3033 Computer System.

31089 **Reactivation coefficient of muon-catalyzed deuterium-tritium fusion and its enhancement.** Takahaski, H. (Brookhaven National Laboratory, Upton, NY 11973). *Fusion Technology;* 9: No. 2, vp(Mar 1986).

The reactivation process of a muon that is stuck to an alpha-particle produced in muon-catalyzed deuterium-tritium (D-T) fusion is studied for the different isotope targets P, D, and T by using the born approximation calculation of charge-transfer cross sections. The isotope dependence is small compared with the large isotope effects observed by Jones et al. The authors calculated density dependence is very similar to that of Bracci and Fiorentini, and it is

not as large as that observed by Jones et al. The enhancement of muon reactivation by application of a high-intensity electric field to the target is studied. Even when the very high electrical field of 40 mv/cm is applied to a liquid hydrogen target, the enhancement is small because of the isotropic emission of an alpha particle in unpolarized D-T fusion. Even in polarized D-T fusion, the enhancement is small.

31090 **Sputtering performance of a pumped limiter for an ignition tokamak.** Brooks, J.N. (Argonne National Laboratory, Fusion Power Program, Argonne, IL 60439). *Fusion Technology;* 9: No. 2, vp(Mar 1986).

The sputtering performance of a pumped limiter for a near-term ignition tokamak was analyzed using the REDEP computer code. Erosion, redeposition, surface shape and heat flux changes with time, and plasma contamination issues were examined. A carbon-coated limiter was found to give acceptable sputtering performance over a typical device lifetime if, and only if, acceptable redeposition properties of carbon are obtained. Beryllium is a good backup material in the event carbon is not acceptable.

31091 **Transmission of fast neutrons through an iron sphere.** Hertel N.E.; Johnson, R.H.; Wehring, B.W.; Dorning, J.J. (University of Illinois at Urbana-Champaign, Nuclear Radiation Laboratory, Nuclear Engineering Program, Urbana, IL 61801). *Fusion Technology;* 9: No. 2, vp(Mar 1986).

Integral Experiments have been performed using a homogeneous iron spherical shell to test neutron cross-section data. Neutron leakage spectra from the shell were measured using ^{252}Cf-fission and (deuterium-tritium) D-T-fusion neutron sources and an Ne-213 spectrometry system. An associated particle detector was used to monitor the absolute D-T neutron source strength as well as any accompanying deuterium-deuterium neutron contamination. The leakage spectra were calculated using the continuous-energy Monte Carlo code VIM and the discrete ordinates S/sub n/ code ANISN employing ENDF/B-IV. For neutron energies between 1 and 5 MeV, the calculations underpredicted the leakage spectrum by factors of 1.4 to 2 for the Californium neutron source and 2 to 3 for the D-T neutron source. The large discrepancies are attributed to inadequate representation of cross-section resonance structure (namely, minima); inadequate representation of the angular and secondary energy distributions for continuum inelastic scattering and (n,2n) reactions also contribute to these discrepancies.

31092 **Scaling of KrF lasers for inertial confinement fusion.** Hunter, A.M.; Hunter, R.O.; Johnson, T.H. (Western Res. Corp., San Diego, CA). *IEEE (Institute of Electrical and Electronics Engineers) Journal of Quantum Electronics;* **QE-22**: No. 3, vp(Mar 1986).

The scaling and design principles for a MJ-scale krypton fluoride laser are derived and applied. First, the scaling limits of size and operation of a single large-aperture module (oscillator or amplifier) are explained, and its performance evaluated. A new scheme for combining amplifier modules into high output power chains is then presented. The performance of this architecture is investigated, showing that it effectively produces both the total energy and pulselength required for inertial confinement fusion using existing technology, while maintaining an easily manageable level of system complexity and acceptable low flux levels on optical elements.

31093 **High energy laser plasma accelerators.** Tajima, T. (Univ. of Texas, Austin). *Laser and Particle Beams;* 3: 351-413(Nov 1985). Contract FG05-80ET53088.

Intense colinear laser beams ω_0, kappa$_0$ and ω_1, kappa$_1$ shone on a plasma with a frequency separation equal to the electron plasma frequency ω/sub pe/ are capable of creating a large coherent longitudinal electric field E/sub L/ = mcω/sub pe//e of the order of 1 GeV/cm for a plasma density of 10^{18} cm^{-3} by the laser beat excitation of plasma oscillations. Accompanying favorable and deleterious physical effects using this process for a high energy beatwave accelerator are discussed: longitudinal dephasing, pump depletion, transverse laser diffraction, plasma turbulence effects, self-steepening, self-focusing, etc. The basic equation, the driven nonlinear Schroedinger equation, is derived to describe this system. Advanced accelerator concepts to overcome some of these problems are proposed, including various forms of the plasma fiber accelerator. An advanced laser architecture suitable for the beat-wave accelerator is suggested. Accelerator physics issues such as the luminosity are discussed. Applications of the present process to the current drive in a plasma and to the excitation of collective oscillations within nuclei are also discussed. 96 references, 38 figures.

31094 **Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study.** Gohar, Y.; Yang, S.-T. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 2, 2010-2020(Sep 1985).

The Blanket Comparison and Selection Study (BCSS) carried out 16 blanket concepts (7 tokamaks and 9 tandem mirror reactors (TMRs)) for the final evaluation process. This process requires all the blanket design parameters, including the energy multiplication factors, the atomic displacement rate in the first wall, and the shielding definition for the reactor. A shielding assessment is performed to determine shielding materials, compositions, arrangements, and thicknesses for each concept. Two shielding criteria are adopted for this assessment: (a) workers are permitted in the reactor hall 1 day after shutdown, and (b) superconductor coils are required to function for a 150 MW x yr/m^2 deuterium-tritium neutron exposure at the first wall without a change in their performances. For the design purpose, the occupational exposure is 0.5 mrem/h, based on working 8 h/day and 40 h/week. This dose level is used to concur with current practice in the nuclear industry and the exposure policy of the U.S. Department of Energy, which limits the on-site personnel exposure level to less than onefifth of the maximum permissible dose equivalent limits. The personnel exposure criterion is used to size the outboard bulk shield for tokamak reactors and the shield thickness between the central cell coils for TMRs. In the fusion power environment the insulator materials are the most sensitive components in the superconductor coils from the radiation damage point of view. A maximum insulator dose of 10^{10} rad in the thermal insulator is used to size the bulk shield in the inboard section of the tokamak reactors and the central cell sections under the coils for TMRs. As a result of this criterion, all other nuclear responses do not exceed any design limit for the superconductor materials or the copper stabilizer.

31095 **A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts.** Jung, J.; Foley, J.V. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 2, 1998-2009(Sep 1985).

Three-dimensional, tritium breeding, and energy multiplication analyses were performed for nine tandem mirror reactor (TMR) designs and seven tokamak reactor designs that had evolved as the "rank-1" concept from the latest Blanket Comparison and Selection Study. These designs include a variety of combinations of candidate breeder, coolant, and structural materials that seem most promising for the respective TMR/tokamak concept application. The analysis was performed using a single consistent computational technique, i.e., a continuous energy Monte Carlo transport method based on MCNP with the associated cross section libraries based on the latest ENDF/B-V data. Through a comparative study of those 16 candidate blanket designs, an attempt is made to rank them from a standpoint of the neutronic blanket performance.

31096 **An assessment of problems associated with tritium containment.** Sze, D.K.; Bjorndahl, W.D.; Hassanein, A.M.; Piet, S.J.; Wong, C.P.C. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 2, 1985-1997(Sep 1985).

A special task group was established as a part of the Blanket Comparison and Selection Study to investigate the problems associated with tritium containment in blanket systems. The goal of the task group was to review the existing experimental results and to define a set of ground rules that would form a common basis for each design group to resolve this particular problem. The work of the task group is summarized. Due to the scarcity of information, and often contradictory nature of the existing information, note that the conclusions are based on the best judgment of the task group. It

is recommended that the conclusions be updated as more experimental results become available.

31097 **Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review.** Liu, Y.Y.; Billone, M.C.; Clemmer, R.G.; Fischer, A.K.; Hollenberg, G.W.; Tam, S.W. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 2, 1970-1984(Sep 1985).

The fabrication, properties, and irradiation behavior of Li_2O and γ-$LiAlO_2$ are reviewed and assessed to determine the potential of these materials to satisfy the basic solid breeder blanket performance requirements. Based on the data analysis and theoretical modeling, a set of major technical uncertainties is identified. These uncertainties include: fabricability of sphere-pac solid breeders; high fluence and burnup effects on thermal conductivity and microstructural stability; high fluence and burnup effects on tritium diffusion coefficients at low temperature; relationship among purge flow chemistry, surface adsorption, and species of released tritium; and mechanical properties and the loads imposed on the structural materials by the breeder during blanket operation. Resolution of these issues is important in assuring that solid breeder blankets can be designed with confidence.

31098 **Liquid-metal corrosion.** Chopra, O.K.; DeVan, J.H.; Smith, D.L.; Sze, D.K.; Tortorelli, P.F. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 2, 1956-1969(Sep 1985).

A review of corrosion and environmental effects on the mechanical properties of candidate structural alloys for use with liquid metals in fusion reactors is presented. The corrosion/mass transfer behavior of austenitic and ferritic steels and vanadium-base alloys is evaluated to determine the preliminary operating temperature limits for circulating and static liquid-lithium and Pb-17Li systems. The influence of liquid-metal environment on the mechanical properties of structural materials is discussed. Corrosion effects of nitrate and fluoride salts are presented. Requirements for additional data are identified.

31099 **Structural analysis under the Blanket Comparison and Selection Study.** Majumdar, S. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 2, 1944-1955(Sep 1985).

Structural design procedures followed in the Blanket Comparison and Selection Study are briefly reviewed. The American Society of Mechanical Engineers Boilers and Pressure Vessels Code, Section III, Code Case N47 has been used as a design guide. Its relevance to fusion reactor applications, however, is open to question and needs to be evaluated in the future. The primary structural problem encountered in tokamak blanket designs is the high thermal stress due to surface heat flux, with fatigue being an additional concern for pulsed systems. The conflicting requirements of long erosion life and high surface heat flux capability imply that some form of stress relief in the first-wall region will be necessary. Simplified stress and fatigue crack growth analyses are presented to show that the use of orthogonally grooved first wall may be a potential solution for mitigating the thermal stress problem. A comparison of three structural alloys on the basis of both grooved and nongrooved first-wall designs is also presented. Other structural problems encountered in tokamak designs include stresses due to plasma disruptions, and magnetohydrodynamic (MHD) pressure drop in liquid-metal-cooled systems. In particular, it is shown that the maximum stress in the side wall of a uniform duct generated by MHD pressure drop cannot be reduced by increasing the wall thickness or by decreasing the span. In contract to tokamak blankets, tandem mirror blankets are far less severely stressed because of a much lower surface heat flux, coolant pressure, and also because of their axisymmetric geometry. Both blankets, however, will require detailed structural dynamics analysis to verify their ability to withstand seismic loadings if the heavy 17Li-83Pb is used as a coolant.

31100 **Structural materials data base assessment for the Blanket Comparison and Selection Study.** Davis, J.W.; Lechtenberg, T.A.; Smith, D.L.; Wiffen, F.W. (McDonnell Douglas Astronautics Company, St. Louis, MO). *Fusion Technology;* 8: No. 2, 1927-1943(Sep 1985).

The Blanket Comparison and Selection Study (BCSS) had as its primary goal the selection of a limited number of blanket concepts for fusion power reactors, to serve as the focus for the U.S. Department of Energy blanket research and development program. To help provide a common basis for evaluation of all candidate blanket concepts considered by the BCSS, a structural materials data base assessment was performed that included a compilation of available materials properties data, specification of limiting criteria for materials performance, and determination of design allowable parameters. Three classes of alloys are currently considered as leading candidates for the first-wall/blanket structure of a fusion power reactor. For the BCSS, one reference or baseline alloy was selected from each class and one low-activation counterpart to each reference alloy was identified for evaluation. The alloy classes, reference alloys, and low-activation analogs selected were: austenitic stainless steels (primary candidate alloy; manganese-stabilized steel); ferritic or martensitic steels (HT-9, Fe-11 Cr-2.5 W-0.3 V-0.15 C); and vanadiumbase alloys (V-15 Cr-5 Ti, reference alloy is low activation). The critical nuclear, thermophysical, and mechanical properties of the three reference alloys were reviewed. Where insufficient data exist for a reliable assessment, best estimates were provided for use in the blanket concepts development. For the low-activation analogs, the same properties as their respective reference alloys were assumed, including radiation damage resistance. The design stress limits, maximum allowable operating temperature, and lifetime were set primarily by radiation damage considerations. Critical design issues associated with each of the reference alloys and low-activation analogs were identified, together with limiting criteria for materials performance.

31101 **The determination of deuterium and tritium in effluent wastewater by pulsed nuclear magnetic resonance spectroscopy.** Attalla, A.; Birkbeck, J.C. (Monsanto Research Corporation, Miamisburg, OH). *Fusion Technology;* 8: No. 2, 2467-2472(Sep 1985). (CONF-850405—).

From 2. national topical meeting on tritium technology in fission, fusion and isotopic applications; Dayton, OH, USA (30 Apr 1985).

A pulsed nuclear magnetic resonance (NMR) procedure was developed for the quantitative determination of deuterium and tritium in radioactive, effluent, wastewater to aid in the design of an efficient combined electrolytic/catalytic exchange system for the recovery of these hydrogen isotopes. The deuterium and tritium NMR signals were observed at 9.210 and 45.7 MHz, respectively. Ten different effluent water samples were analyzed for deuterium and tritium to establish base-line data for the preparation of standard reference samples. The hydrogen isotope concentrations ranged from 0.11 to 2.40 g deuterium and from 2.0 to 21.0 mg tritium per liter of processed sample. The standard deviation of the hydrogen isotope determinations is + or - 0.017g deuterium and + or -0.06 mg tritium per liter of processed effluent water. In the future, the effectiveness of specially prepared and analyzed (calorimetry) effluent samples as tritium standards will be investigated.

31102 **Tritium surface contamination.** Sienkiewicz, C.J. (Monsanto Research Corporation, Miamisburg, OH). *Fusion Technology;* 8: No. 2, 2444-2454(Sep 1985). (CONF-850405—).

From 2. national topical meeting on tritium technology in fission, fusion and isotopic applications; Dayton, OH, USA (30 Apr 1985).

Glovebox wipe surveys were conducted to correlate surface tritium contamination with atmospheric tritium levels. Surface contamination was examined as a function of tritium concentration and of tritium form, HT/T_2 and HTO. The relationship between atmospheric HTO concentration and cleanup time was also investigated.

31103 **Helium-cooled, flibe breeder, beryllium multiplier blanket.** Moir, R.W.; Berwald, D.H.; De Van, J.H.; Jung, J.; Lee, J.D.; Muninger, R.C.; Neef, W.S.; Sherwood, A.E. (Lawrence Livermore National Laboratory, University of California Livermore, CA). *Fusion Technology;* 8: No. 1, 133-148(Jul 1985).

The concept described for the blanket surrounding a fusion reaction chamber is based on the use of molten fluoride salts to convert fusion energy into electricity and to breed the tritium fuel

for the fusion power plant. Helium cools the first-wall and the blanket internals, which consist of a bed of beryllium balls in which neutrons are multiplied. The neutrons are used to breed tritium and also to release extra energy in exothermic nuclear reactions. Tritium is bred in the molten Flibe salt ($LiF + BeF_2$) that flows slowly (about 0.1 m/s) in steel tubes and is removed from the salt and the helium by processing both streams. Because the solubility of tritium in Flibe salt is so low, there is a strong driving force for tritium permeation. A 10-μmthick tungsten permeation barrier, deposited by chemical vapor deposition on the salt-carrying tubes, is proposed for preventing excessive tritium permeation into the helium stream. A 1-mm-thick aluminum jacket on the steel steam generator tubes is proposed to prevent excessive tritium permeation into the steam system. Flibe salt has safety advantages with respect to large accidents in that it will not react with air or water, in contrast to liquid lithium. For the first time, a method is proposed for recycling solid material in fusion blankets. To accomplish this, beryllium pebbles were chosen because the pebbles can be loaded into the blanket after manufacturing and, to accommodate radiation-induced swelling, can be moved periodically by flowing. Once the balls have reached their radiation damage lifetime, they can be removed from the blanket for refabrication and recycle.

31104 **Helium-cooled blanket designs.** Wong R.F.; Bourgue, R.F.; Cheng, E.T.; Clement, P.C.; Creedon, R.L.; Maya, I.; Ruder, R.H.; Schultz, K.R. (GA Technologies, Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 114-132(Jul 1985).

A systematic selection and evaluation of helium-cooled blanket concepts has been performed as part of the Blanket Comparison and Selection Study (BCSS). Helium-cooled Li_2O, lithium, $LiAlO_2$/Be, and Flibe/Be blanket concepts were selected for detailed design and evaluation. These concepts are applicable to both tokamak and tandem mirror reactors (TMRs). The design and analysis of Li_2O, lithium, and $LiAlO_2$/Be blanket concepts are presented. Previous blanket designs were studied and the pressurized lobe configuration was selected for the helium-cooled BCSS designs. Fifty-four different combinations of structural, breeder, and neutron multiplier materials were considered and four helium-cooled blanket concepts were selected for detailed design and evaluation. Mechanical, thermal, and neutronic designs were developed, and tritium control methods were specified. In the final BCSS evaluation, the Li_2O blanket design ranked second for tokamaks and third for TMRs. The lithium blanket design ranked third for tokamaks and fourth for TMRs. To help guide future research and development, the critical issues associated with each of the helium-cooled designs were identified and necessary experimental data highlighted. These data include irradiation behavior of the blanket materials, compatibility between the structure and liquid-metal breeder materials, and the behavior of tritium in a helium-cooled blanket environment. The designs offer favorable performance, design simplicity, and attractive safety features for fusion reactors. Design improvements were identified that could allow still better performance of the helium-cooled blanket designs.

31105 **Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors.** Cha, Y.S.; Gohar, Y.; Hassanein, A.M.; Majumdar, S.; Picologlou, B.F.; Smith, D.L.; Szo, D.K. (Argonne National Laboratory, Fusion Power Program, Argonne, IL). *Fusion Technology;* 8: No. 1, 90-113(Jul 1985).

Results of the self-cooled, liquid-metal blanket design from the Blanket Comparison and Selection Study (BCSS) are summarized. The objectives of the BCSS project are to define a small number (about three) of blanket concepts that should be the focus of the blanket research and development (R&D) program, identify and prioritize the critical issues for the leading blanket concepts, and provide technical input necessary to develop a blanket R&D program plan. Two liquid metals (lithium and lithium-lead (17Li-83Pb)) and three structural materials (primary candidate alloy (PCA), ferritic steel (FS) (HT-9), and vanadium alloy (V-15 Cr-5 Ti)) are included in the evaluations for both tokamaks and tandem mirror reactors (TMRs). TMR is of the tube configuration similar to the Mirror Advanced Reactor Study design. Analyses were performed in the following generic areas for each blanket concept: MHD, thermal hydraulics, stress, neutronics, and tritium recovery. Integral analyses were performed to determine the design window for each blanket design. The Li/Li/V blanket for tokamak and the Li/Li/V, LiPb/LiPb/V, and Li/Li/HT-9 blankets for the TMR are judged to be top-rated concepts. Because of its better thermophysical properties and more uniform nuclear heating profile, liquid lithium is a better coolant than liquid 17Li83Pb. From an engineering point of view, vanadium alloy is a better structural material than either FS or PCA since the former has both a higher allowable structural temperature and a higher allowable coolant/structure interface temperature than the latter. Critical feasibility issues and design constraints for the self-cooled, liquid-metal blanket concepts are identified and discussed.

31106 **Overview of the Blanket Comparison and Selection Study.** Smith, D.L. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 10-44(Jul 1985).

The Blanket Comparison and Selection Study (BCSS) was a 2-yr, multilaboratory project initiated by the U.S. Department of Energy/Office of Fusion Energy. Its primary objectives were to define a limited number of blanket concepts that should provide the focus of the blanket research and development (R & D) program, and identify and prioritize critical issues for the leading blanket concepts. The BCSS focused on the mainline approach for fusion reactor development, namely, the D-T-Li fuel cycle, tokamaks and tandem mirror reactors (TMRs) for electrical energy production, and a reactor parameter space that is generally considered achievable with modest extrapolations from the current data base. The STARFIRE and Mirror Advanced Reactor Study reactor and plant designs, with a nominal first-wall neutron load of 5 MW/m^2, were used as reference designs for the study.

31107 **Safety evaluation of the Blanket Comparison and Selection Study.** Piet, S.J. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 77-89(Jul 1985).

The results of the safety evaluation of the Blanket Comparison and Selection Study (BCSS) are presented. The safety evaluation measured the relative safety and environmental attractiveness of the final group of BCSS blanket concepts for application with either a tokamak or tandem mirror fusion reactor. Two types of blankets were found to be the most attractive in the safety evaluation. One top-blanket-type is a helium-cooled HT-9 structure with a Li_2O breeder, which is preferred if tritium effluent control is good; a lithium breeder would be the backup. The other top blanket concept is liquid-metal-cooled V-15 Cr-5 Ti structure with lithium coolant/breeder, preferred if air and water chemical reactions are adequately controlled; 17Li-83Pb would be the backup coolant/breeder material.

31108 **Tokamak Fusion Core Experiment maintenance study.** Snyder, A.M.; Watts, K.D. (EG & G Idaho, Inc./Mechanical Engineering, Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 291-295(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The recently completed Tokamak Fusion Core Experiment (TFCX) design project investigated potential "next generation" tokamak concepts. An important early development of the design was the incorporation of remote maintainability. Early coordination and incorporation of maintenance aspects to the design of the device and facilities will ensure that the machine can ultimately be maintained and repaired efficiently and cost effectively. A rigorously formatted engineering trade study was performed to determine the preferred configuration for the TFCX reactor based primarily on maintenance requirements. The study indicates a preferred design with an external vacuum vessel and torodial field coils that can be removed by simple radial motion. The trade study is presented and the preferred TFCX configuration is described.

31109 **Fusion reactor and test cell configuration.** Fee, D.S. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 285-290(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Remote maintenance and repair considerations will play a major role in determining the design and layout of next-generation fusion devices, including the buildings and facilities supporting the

nuclear operation of those devices. The reactor/test cell described in this paper represents a "nominal copper" TFCX (Tokamak Fusion Core Experiment) concept that emphasizes an integrated approach to the design of the experimental device and its supporting facilities. This configuration is unique with respect to other TFCX concepts in that it promotes the use of a modular design with readily replaceable stand-alone sectors, integrates the machine and test cell structures, incorporates a facility arrangement that results in a smaller overall facility footprint, reduces the transportation path of activated hardware, and allows access to three sides of the test cell facilities.

31110 **Experimental facility for studying MHD effects in liquid metal cooled blankets.** Reed, C.B.; Dauzvardis, P.V.; Picologiou, B.F. (Argonne National Laboratory, Engineering Division, Argonne, IL). *Fusion Technology;* 8: No. 1, 257-263(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The capabilities of a facility, brought into service to collect data on magnetohydrodynamic (MHD) effects pertinent to liquid-metal-cooled fusion reactor blankets, are presented. The facility, designed to extend significantly the existing data base on liquid metal MHD, employs eutectic NaK as the working fluid in a room temperature closed loop. The instrumentation system is capable of collecting detailed data on pressure, voltage, and velocity distributions at any axial position within the bore of a 2 Tesla conventional electromagnet. The axial distribution of the magnetic field can be uniform or varying with either rapid or slow spatial variations. The magnet gap dimensions, for the uniform field of 2T, are 15.3 cm high x 0.76 m wide x 1.83 m long. NaK was circulated in December 1984 and the magnet was energized in March 1985. Shakedown tests in a round pipe test section are currently underway.

31111 **Magnetohydrodynamic considerations for the design of self-cooled liquid-metal fusion reactor blankets.** Picologlou, B.F. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 276-284(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

It is shown that magnetohydrodynamic (MHD) effects present not only an efficiency but also a feasibility issue for self-cooled liquid-metal blankets of magnetically confined fusion reactors, especially tokamaks. For this reason, MHD considerations are the main driver in the development of the design of such blankets. This paper, intended for the designer, presents in a unified way these considerations, as well as effective strategies to deal with adverse MHD effects.

31112 **MHD flow control as a design approach for self-cooled liquid-metal blankets of magnetic confinement fusion reactors.** Walker, J.S.; Picologlou, B.F. (Department of Theoretical and Applied Mechanics, University of Illinois at Urbana-Champaign, Urbana, IL). *Fusion Technology;* 8: No. 1, 270-275(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A self-cooled, liquid-metal blanket for a magnetic confinement fusion reactor has generally been viewed as a conventional cooling system with the additional, negative effects of the magnetohydrodynamic (MHD) interaction which must somehow be overcome. Recent studies of liquid-metal flows in strong magnetic fields have revealed the existence of characteristic surfaces in such flows. Pressure and voltage are constant to first order on these surfaces, while the surfaces are streamsurfaces for the fluid velocity. In the proposed design approach, these surfaces are used to create the flow patterns which absorb the heat where it is deposited and distribute it throughout the coolant. These MHD "guidevanes" can eliminate much of the complexity of previous blanket designs. Therefore, MHD effects are used as a positive design tool.

31113 **The influence of leakage currents on MHD pressure drop.** Madrame, H.; Taghavi, K.; Tillack, M.S. (University of California, Los Angeles, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 264-269(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The MHD pressure drop in the second wall orifice which connects the first wall cooling channel and the header in one of the BCSS blankets is discussed. Though the second wall is thin, the pressure drop in the orifice can be very large because of leakage current effects. If eddy currents leak and do not have to pass through thin walls, the resistivity of the current path may be low and the current intensity may be high, which induces a high pressure drop. The presence of leakage current greatly affects the MHD pressure drop in fusion reactor blankets.

31114 **Tokamak Fusion Core Experiment (TFCX) special-purpose remote maintenance systems.** Masson, L.S.; Welland, H.J. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 314-317(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A key element in the preconceptual design of the Tokamak Fusion Core Experiment (TFCX) was the development of design concepts for special-purpose remote maintenance systems. Included were systems for shield sector replacement, vacuum vessel sector and toroidal field coil replacement, limiter blade replacement, protective tile replacement, and general-purpose maintenance. This paper addresses these systems as they apply to the copper toroidal field (TF) coil version of the TFCX.

31115 **Tandem Mirror Reactor power balance studies.** Gorker, G.E.; Perkins, L.J. (Grumman Aerospace Corporation, Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 332-337(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A Tandem Mirror Reactor (TMR) power plant balance model has been developed and is now being used as a computer aid for performing parametric studies. End-cell power injection into the plasma and the physics plasma Q are used to determine the fusion power. About 80% of the fusion power is transferred by high-energy neutrons to the blanket modules and structures. The other 20% of the fusion power in the highenergy alpha particles is used to heat the deuterium-tritium (D-T) plasma. Most of the plasma-ionized particles transfer their energy to the halo dumps and direct converters. The plant efficiency is calculated for three different system cycles: (1) the pressurized water/saturated steam cycle, (2) the superheated steam cycle, and (3) the more complex superheat/reheat cycle. There is a significant improvement in plant efficiency as the electrical power multiplication factor and steam cycle efficiency increases.

31116 **Computerized cost estimation spreadsheet and cost data base for fusion devices.** Hamilton, W.R.; Rothe, K.E. (Fusion Engineering Design Center, Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 356-361(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

An automated approach to performing and cataloging cost estimates has been developed at the Fusion Engineering Design Center (FEDC), wherein the cost estimate record is stored in the LOTUS 1-2-3 spreadsheet on an IBM personal computer. The cost estimation spreadsheet is based on the cost coefficient/cost algorithm approach and incorporates a detailed generic code of cost accounts for both tokamak and tandem mirror devices. Component design parameters (weight, surface area, etc.) and cost factors are input, and direct and indirect costs are calculated. The cost data base file derived from actual cost experience within the fusion community and refined to be compatible with the spreadsheet costing approach is a catalog of cost coefficients, algorithms, and component costs arranged into data modules corresponding to specific components and/or subsystems. Each data module contains engineering, equipment, and installation labor cost data for different configurations and types of the specific component or subsystem. This paper describes the assumptions, definitions, methodology, and architecture incorporated in the development of the cost estimation

spreadsheet and cost data base, along with the type of input required and the output format.

31117 **Tandem Mirror Reactor Systems Code (TMRSC).** Reid, R.L.; Barrett, R.J.; Rothe, K.E. (FEDC/Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 350-355(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

This paper describes a computer code developed to model a tandem mirror reactor. This is the first tandem mirror reactor model to couple the highly linked physics, magnetics, and neutronic analysis into a single code. Results from this code for two sensitivity studies are included in this paper. These studies are designed to determine the impact of center cell plasma radius, length, and ion temperature on reactor cost and performance at constant fusion power and to determine the impact of reactor power level on cost.

31118 **The Mirror Fusion Test Facility (MFTF-B)--status.** Karpenko, V.N. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). *Fusion Technology;* 8: No. 1, 427-432(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Mirror Fusion Test Facility (MFTF-B), now under construction at Lawrence Livermore National Laboratory, represents more than an order-ofmagnitude step up from earlier magnetic mirror experiments on the way to a future mirror fusion reactor. In fact, when the device begins operating in 1988, it will be capable of achieving plasma performance approaching scientific breakeven for D-T equivalent operation. We have taken major steps to develop MFTF-B technologies for tandem mirrors. In the machine, we will use steady-state, high-field, superconducting magnets on reactorelevant scales. The 30-s beam pulses, ECRH, and ICRH will also introduce near steady-state technologies into those systems.

31119 **Big Dee - A flexible facility operating near breakeven conditions.** Luxon, J.L.; Davis, L.G. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 441-449(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Doublet III tokamak facility is presently undergoing an upgrade to Big Dee, a device projected to be capable of producing plasmas with parameters approaching breakeven conditions, albeit in hydrogen plasmas. The goal of the upgrade has been to develop a facility capable of studying confinement and beta in non-circular discharges at parameters near breakeven conditions while maintaining the flexibility and accessibility necessary to allow a wide range of problems to be addressed. The upgrade replaces the vacuum vessel and outermost plasma shaping coils allowing higher plasma currents and improved access.

31120 **An economic analysis of fusion breeders.** Delene, J.G. (Engineering Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 459-464(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

This paper presents a study of the economic performance of Fission/Fusion Hybrid devices. This work takes fusion breeder cost estimates and applies methodology and cost factors used in the fission reactor programs to compare fusion breeders with Liquid Metal Fast Breeder Reactors (LMFBR). The results of the analysis indicate that the Hybrid will be in the same competitive range as proposed LMFBRs and have the potential to provide economically competitive power in a future of rising uranium prices. The sensitivity of the results to variations in key parameters is included.

31121 **New directions in Tokamak reactors.** Baker, C.C. (Argonne National Laboratory, 9700 S. Cass Avenue Argonne, IL). *Fusion Technology;* 8: No. 1, 707-716(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

It has been five years or more since the last major studies were completed of the tokamak as a commercial power reactor. During that time there have been major physics and technology developments in magnetic fusion as well as programmatic and political changes. There exists a significant number of new ideas which can substantially improve the tokamak concept as a power reactor. This paper outlines some major goals and new directions for a series of scoping studies - Tokamak Power Systems Studies - which are currently in progress.

31122 **Design options for commercial reactors with resistive magnets.** Bromberg, L. (Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, MA). *Fusion Technology;* 8: No. 1, 747-758(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

In this paper, the options available for tokamak reactors with normal conducting magnets will be described. The advantages and disadvantages of using normal magnets in fusion tokamak reactors will be described. The impact of the use of resistive magnets on the capital cost, environmental concerns and availability (related to cost of electricity) of a tokamak reactor will be discussed. Special emphasis on electricity producing reactors will be given.

31123 **A tokamak ignition/burn experimental research device.** Henning, C.D.; Barr, W.L.; Bulmer, R.H.; Doggett, J.N.; Hoard, R.W.; Johnston, B.M.; Lee, J.D.; Logan, B.G.; Miller, J.R.; Slack, D.S. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). *Fusion Technology;* 8: No. 1, 1351-1358(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

(As part of a continuing effort by the Office of Fusion Energy to define an ignition experiment, a superconducting tokamak has been designed with thin neutron shielding and aggressive magnet and plasma parameters. By so minimizing the inner radial dimensions of the tokamak center post, coil, and shielding region, the plasma major radius is reduced with a corresponding reduction in device costa. The peak nuclear-heating rate in the superconducting TF coils is 22 mW/cm^3, which results in a steady heat load to the cryogenic system of 50 kW. Fast-wave, lower-hybrid heating would be used to induce a 10-MA current in a moderate density plasma.) Then pellet fueling would raise the density to achieve ignition as the current decays in a few hundred seconds. Steady-state current drive in subignited conditions permits a 0.8 MW/m^2 average wall loading to study plasma and nuclear engineering effects.

31124 **Nuclear data needs for fusion energy development.** Cheng, E.T. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 1423-1430(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

As part of the U.S. DOE Office of Fusion Energy Nuclear Data Needs program, we have continued assessment of the nuclear data needs for the development of fusion energy. We have identified and reviewed the high priority elements whose neutron emission data are needed for a near-term fusion ignition facility and fusion power reactor designs for demonstrating the scientific and engineering feasibilities of fusion energy. We found that most of the elements identified here are lacking experimental data from 6 to 15 MeV except hydrogen, lithium, beryllium, and copper. A list of high priority dosimetry cross sections was developed that includes some 29 reactions, including 6 reactions recommended by the plasma diagnostic group of PPPL. Of these 29 reactions, 18 cross sections were chosen to be included in the ENDF/BVI dosimetry files. The activation cross sections needed for elements to be used in the near-term ignition device and future power reactors were compiled. These cross sections were prioritized according to their activation levels and half-lives of their activation products. All these cross sections are going to be included in the END/B-VI activation files.

31125 **Status of methods, codes and applications for sensitivity and uncertainty analysis.** Youssef, M.Z. (Mechanical, Aerospace and Nuclear Engineering Department, University of California, Los Angeles, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 1552-1570(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Described are procedures to be followed in applying cross-section sensitivity and uncertainty analysis to arrive at estimates for the uncertainty associated with an integrated reactor performance parameter R. Means to reduce such uncertainty are outlined. The pertaining computational codes used as analytical tools to carry out the cross-section sensitivity/ uncertainty analysis are reviewed with emphasis on their current limitations and possible improvements. The range of the uncertainty in the prediction of the tritium breeding ratio TBR due exclusively to current uncertainties in the nuclear data field is presented as an application for the sensitivity and uncertainty methods and codes.

31126 **Technical benefit of an international project.** Flanagan, C.A. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1297-1300(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

One critical issue examined in the present phase of the International Tokamak Reactor (INTOR) has been an evaluation of the technical benefit of dividing up the design and component production tasks of all major advanced technologies among all participants. Two approaches were evaluated: (a) a "splitting" approach in which each country provides 1/4 of the components of each major system (e.g., 3 of 12 TF coils), (b) a "branching" approach in which each country provides all components of selected major systems (e.g., first country provides all TF coils, second country provides all torus sectors, etc.). Quantitative cost and schedule estimates were developed for each of the two approaches and compared to the cost and schedule of the entire device if it were produced only by one country. The results of the U.S. evaluation indicated that the ratio of total estimated cost to the "national" cost was 1.66 for "splitting" and 1.20 for "branching." The cost per participant was 0.41 and 0.30, respectively. The increase in the construction schedule was estimated to be 2.6 years.

31127 **Tokamak Fusion Core Experiment facilities Functional and Operational Requirements.** Commander, J.C. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 1301-1305(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A team of national laboratory, university, and industrial participants completed the preconceptual design for the Tokamak Fusion Core Experiment (TFCX), a long pulse, plasma ignition machine, and required support facilities. Functional and Operational Requirements (F & ORs) for the TFCX support facilities were developed as the basis for the preconceptual design, ensuring that adequate housing and site would be provided to support the tokamak machine and auxiliary systems. This paper presents partial F & ORs developed for the base case TFCX machine, the nominal superconducting option (liquid helium-cooled magnets), and describes the resulting preconceptual design.

31128 **Evolution of the Fusion Power Demonstration tandem mirror reactor configuration.** O'Toole, J.A.; Lousteau, D.C. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1306-1311(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

This paper gives a presentation of the evolution of configurations proposed for tandem mirror Fusion Power Demonstration (FPD) machines. The FPD study was undertaken to scope the mission as well as the technical and design requirements of the next tandem mirror device. Three configurations, entitled FPD I, II, and III were studied. During this process new systems were conceived and integrated into the design, resulting in a significantly changed overall machine configuration. The machine can be divided into two areas. A new center cell configuration, minimizing magnetic field ripple and thus maximizing center cell fusion power, features a semicontinuous solenoid. A new end cell has evolved which maintains the required thermal barrier in a significantly reduced axial length. The reduced end cell effective length leads to a shorter central cell length being required to obtain minimum ignition conditions. Introduced is the concept of an electron mantle stabilized octopole arrangement. The engineering features of the new end cell and maintenance concepts developed are influenced to a great extent by the octopole-based design. The new ideas introduced during the FPD study have brought forth a new perspective of the size, design, and maintenance of tandem mirror reactors, making them more attractive as commercial power sources.

31129 **Overview of the Fusion Power Demonstration study.** Nelson, W.D.; Doggett, J.N.; Logan, B.G.; Lousteau, D.C.; O'Toole, J.A.; Perkins, L.J. (Fusion Engineering Design Center, Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1312-1317(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

This paper summarizes the 1984 Fusion Power Demonstration (FPD) design study. Three major configurations were investigated. Two were based on the Mirror Advanced Reactor Study (MARS) end cells, which use "C" coil magnets in Yin-Yang pairs to help stabilize the plasma. The third configuration utilized an octopole in the end cell. Detailed studies of major components were undertaken and critical issues were identified and examined. Integrated configuration drawings of each of the machines were prepared and are presented here. A Tandem Mirror Reactor Systems Code (TMRSC) was assembled for use in optimizing future device designs but will not be discussed. The various sections of this paper address the mission, goals, and brief design descriptions of the three configurations.

31130 **Modeling and optimization of operating parameters for a test-cell option of the Fusion Power Demonstration-II tandem mirror design.** Haney, S.W.; Fenstermacher, M.E. (Massachusetts Institute of Technology, Cambridge, MA). *Fusion Technology;* 8: No. 1, 1324-1329(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Models of tandem mirror devices operated with a test-cell insert have been used to calculate operating parameters for FPD-II+T, an upgrade of the Fusion Power Demonstration-II device. Two test-cell configurations were considered, one accommodating two 1.5 m blanket test modules and the other having four. To minimize the cost of the upgrade, FPD-II+T utilizes the same coil arrangement and machine dimensions outside of the test cell as FPD-II, and the requirements on the end cell systems have been held near or below those for FPD-II. The maximum achievable test cell wall loading found for the short test-cell was 3.5 MW/m^2 while 6.0 MW/m^2 was obtainable in the long test-cell configuration. The most severe limitation on the achievable wall loading is the upper limit on test-cell beta set by MHD stability calculations. Modification of the shape of the magnetic field in the test-cell by improving the magnet design could raise this beta limit and lead to improved test-cell performance.

31131 **A comparison of all-remote and personnel access maintenance operations for INTOR.** Sumpinato, P.T.; Finn, P.A.; Gohar, M.Y.; Stasko, R.R. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 308-313(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The INTOR reference design was developed to permit limited maintenance operations external to the reactor in a "hands-on" mode; all internal operations would be remotely accomplished. The design embodies those requirements for shielding, tritium containment and cleanup, and confinement of contaminated particulate matter to permit personnel access. The cost reflects these requirements, at least to first order. The impact of personnel access on the reactor design and its cost are cause to reexamine the maintenance

approach on which much of the present configuration is based. The purpose of this study is to compare the benefits and costs associated with personnel access maintenance procedures to those associated with all-remote maintenance procedures and to identify modifications to the baseline design that could enhance maintenance operations.

31132 **U.S. Blanket Technology Programs.** Nygren, R.E. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 511-524(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Experimental research in U.S. programs related to blanket technology is described through brief summaries of the objectives, facilities, recent experimental results and principal investigators for the Blanket Technology Program, TRIO-1 Experiment, TSTA, Fusion Hybrid Program and selected activities in the Fusion Materials and Fusion Safety Programs in neutronics research.

31133 **Nuclear performance optimization of the Be/Li/Th blanket for the fusion breeder.** Lee, J.D.; Bandini, B.R. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 483-490(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

More rigorous nuclear analysis, including treatment of resonance self-shielding effects coupled with an optimization procedure, has resulted in improved performance of the Be/Li/Th blanket. Net U-233 breeding ratio has increased 36% (to 0.84) while at an average U-233/Th ratio of 0.5 a/o average energy multiplication has increased only 12% (to 2.1) compared with earlier results.

31134 **Test requirements for solid breeder blanket thermal behavior.** Taghavi, K.; Gierszewski, P. (Mechanical, Aerospace and Nuclear Engineering Department, University of California at Los Angeles, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 525-530(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Testing of solid breeder blanket issues may be constrained by available test device parameters such as heat source and pulse length. Consequently, it is important to consider methods to preserve full-reactor conditions under reduced device parameters. Analyses of several aspects of solid breeder thermal behavior were performed to explore options for scaling this behavior and to identify limits on the test device parameters beyond which test results would not reasonably extrapolate to reactor conditions. The results suggest that solid breeder blankets need at least 1 MW/m^2 neutron wall load, 0.2 MW/m^2 surface heat load and 500 s burn length.

31135 **Nuclear responses in INTOR plasma stabilization elements.** Gohar, Y.; Gilligan, J.; Jung, J.; Mattas, R.F.; Miley, G.H.; Wiffen, F.W.; Yang, S. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 565-572(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Nuclear responses in the plasma stabilization elements were studied in a parametric fashion as a part of the transient electromagnetics critical issue C of ETR/INTOR activity. The main responses are neutron fluence and radiation dose in the insulator material, induced resistivity and atomic displacement in the conductor material, nuclear heating and life analysis for the elements. Copper and aluminum conductors with either $MgAl_2O_4$ or MgO insulating material were investigated. Radiation damage and life analysis for these elements were also discussed.

31136 **Elastic-plastic analysis of slender first wall structures.** Orient, G.E.; Garner, J.K.; Gierszewski, P.J. (University of California at Los Angeles, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 586-591(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Several current fusion first wall designs consist of slender channels. This type of structure may be analysed by describing the bending behavior using a thin member theory and solving the relevant boundary value problem for the axial stresses due to the end conditions and the axial load variations. Analytical and finite element models are presented here that can treat a range of shapes and end constraints, have been implemented on microcomputers, and may be fast and cost-effective tools for preliminary design. Representative first wall designs are analyzed, illustrating the complex and important influence of irradiation creep.

31137 **Solid breeder/structure mechanical interaction and thermal stability.** Liv, Y.Y.; Billone, M.C.; Taghavi, K. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 630-636(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Solid breeder/structure mechanical interaction (BSMI) during fusion reactor blanket operation is a potential failure mode which could limit the lifetime of the blanket. The severity of BSMI will generally depend on the materials, specific blanket designs, and blanket operating conditions. Thermomechanical analyses performed for a helium-cooled blanket employing Li_2O/HT-9 plates indicate that BSMI could be a serious concern for this blanket.

31138 **Poloidal divertor systems for impurity and particle control in ignition Tokamaks.** Post, D.E.; Mattas, R. (Plasma Physics Laboratory, Princeton University, Princeton, NJ). *Fusion Technology;* 8: No. 1, 779-790(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Poloidal divertors and pumped limiters are the leading candidates for impurity and particle control systems for ignited tokamaks. Such systems must be able to provide heat removal and He pumping while satisfying the requirements for minimum plasma contamination by impurities, reasonable component lifetime (α 1 year), and minimum size and cost and maximum simplicity. The advantage of poloidal divertor systems is that they offer the possibility of low sputtering rates for the first wall components and modest pumping requirements due to the formation of a cool, dense plasma near the collector plates. Estimates made as part of the INTOR study indicate that the sputtering rates for pumped limiters could be unacceptably large. A engineering design study of a poloidal divertor system for an ignited tokamak indicates that such a system offers a reasonable solution to the impurity and particle control problem at only a modest increase in total reactor cost (about 7%) and complexity compared to a pumped limiter system.

31139 **The engineering and material aspects of impurity control systems.** Koski, J.A. (Sandia National Laboratories, Albuquerque, NM). *Fusion Technology;* 8: No. 1, 791-799(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The design of impurity control systems for fusion energy devices is discussed from the engineering and materials viewpoint. First, examples of impurity control devices are presented, and the plasma edge environment for which they are designed is briefly described. Materials concerns related to the design of the components are discussed and some currently proposed designs presented. Engineering tools available to the designer are listed, and some commonly encountered engineering analysis problems described.

31140 **A molten salt cooling 17Li-83Pb breeding blanket concept.** Sze, D.K.; Cheng, E.T. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 953-957(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A description of a fusion breeding blanket concept using draw salt coolant and static 17Li-83Pb is presented. 17Li-83Pb has high breeding capability and low tritium solubility. Draw salt operates at low pressure and is inert to water. Corrosion, MHD, and tritium containment problems associated with the MARS design are alleviated because of the use of a static LiPb blanket. Blanket tritium recovery is by permeation toward the plasma. A direct contact

steam generator is proposed to eliminate some generic problems associated with a tube shell steam generator.

31141 **Modeling of tritium transport in lithium aluminate fusion solid breeders.** Billone, M.C.; Clemmer, R.G. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 875-880(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Lithium aluminate is a candidate tritiumbreeding material for fusion reactor blankets. One of the concerns with using $LiAlO_2$ is tritium recovery from this material, particularly at low operating temperatures and high fluences. The data from various tritium release experiments with γ-$LiAlO_2$ and related materials are reviewed and analyzed to determine under what conditions bulk diffusion is the rate-limiting mechanism for tritium transport and what the effective bulk diffusion coefficient should be. Steady-state and transient models based on bulk diffusion are developed and used to interpret the data. Design calculations are then performed with the verified models to determine the steady-state inventory and time to reach equilibrium for a full-scale fusion blanket.

31142 **Thermochemical comparison of the effectiveness of protium purging of fusion breeders.** Fischer, A.K.; Johnson, C.E. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 871-874(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The tritium breeders for a fusion reactor, Li_20, $LiAlO_2$, and Li_4SiO_4, are compared on a thermochemical basis in respect to their response to protium purging. Two oxygen activity levels, established by H_2O:H_2 ratios of 100: 1 and 1:100 are considered at the temperatures 900 and 1300K. In terms of tritium release (all gaseous forms), $LiAlO_2$ is better than Li_20 and this in turn better than Li_4SiO_4. At 900K, Li_20 and $LiA10_2$ release more tritium than at 1300K. Li_4SiO_4 releases more tritium at 1300K than at 900K.

31143 **Design of a helium-cooled molten-salt fusion breeder.** Moir, R.W.; Berwald, D.H.; DeVan, J.H.; Fulton, F.J.; Grimes, W.R.; Lee, J.D.; Muegei, F.; Neef, W.S.; Sherwood, A.E.; Whitley, R.H. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). *Fusion Technology;* 8: No. 1, 465-473(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A new conceptual blanket design for a fusion reactor produces fissile material for fission power plants. Fission is suppressed by using beryllium, rather than uranium, to multiply neutrons and also by minimizing the fissile inventory. The molten-salt breeding media is circulated through the blanket and on to the online processing system, where ^{233}U and tritium are continuously removed. Helium cools the blanket including the steel pipes containing the molten salt. Austenitic steel was chosen because of its ease of fabrication, adequate radiation-damage lifetime, and low corrosion rate by molten salt. We estimate the breeder, having 3000 MW of fusion power, produces 6400 kg of ^{233}U per year, which is enough to provide make up for 20 GWe of LWR per year (or 14 LWR plants of 4440 MW /sub t/) or twice that many HTGRs or CANDUs. Safety is enhanced because the afterheat is low and the blanket materials do not react with air or water. The fusion breeder based on a pre-MARS tandem mirror is estimated to cost $4.9B or 2.35 times an LWR of the same power. The estimated present value cost of the ^{233}U produced is)40/g if utility financed or)16/g if government financed.

31144 **Counter current extraction system for tritium recovery from 17Li-83Pb.** Sze, D.K. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 887-890(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A counter current extraction system is proposed here to recover tritium from 17Li-83Pb. The multiple stage extraction system is used to reduce the resistance to the molecular diffusion in the liquid phase, while a counter current helium purge gas is used to reduce the resistance in the gas phase. To reduce the purge gas requirement and alleviate the tritium containment problem, hydrogen is added to the purge gas. An isotope separation system is designed to separate the hydrogen from the tritium.

31145 **A systematic methodology for estimating direct capital costs for blanket tritium processing systems.** Finn, P.A. (Chemical Technology Division, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 904-910(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

This paper describes the methodology developed for estimating the relative capital costs of blanket processing systems. The capital costs of the nine blanket concepts selected in the Blanket Comparison and Selection Study are presented and compared.

31146 **Thermal-hydraulic thermomechanical testing of solid breeder blanket modules using microwave energy.** Misra, B.; Kustom, R.L.; Nygren, R.E.; Poeppel, R.B. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 927-930(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

An experimental program is undertaken to assess whether microwave energy can be used to study the thermomechanical response of solid breeder blanket modules. The experimental setup consists of a water-cooled Y-$LiA10_2$ solid breeder blanket module heated by a 10-kW Klystron at 200 MHz. The spatial distribution of temperature at a series of power levels will show whether microwave energy is attractive as a potential power source for nonnuclear testing of solid breeder blanket modules.

31147 **End cell shielding and streaming analysis of MARS tandem mirror reactor.** El-Guebaly, L.A. (University of Wisconsin, Madison, WI). *Fusion Technology;* 8: No. 1, 1043-1048(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

In recent studies of tandem mirror reactors some attention has been focused on the problems associated with radiation streaming into penetrations of both the central fusion chamber and the end cells. This work presents the radiation analysis for the end cells of the commercial tandem mirror reactor MARS. The amount of radiation streaming into the penetrations was quantified and the radiation problems at the direct convertor were analyzed.

31148 **Advanced inboard shielding design for Tokamak fusion reactors.** El-Guebaly, L.A.; Sawan, M.E. (Fusion Technaology Institute, University of Wisconsin-Madison, Madison, WI). *Fusion Technology;* 8: No. 1, 1037-1042(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The recent physics and technology advances in the field of high power density compact tokamak reactors have established the need for advanced inboard shielding design. This work presents the design of an optimal inboard shield and assesses the limits on the radiation effects in the magnets of a high wall loading (10 MW/m^2) tokamak design. A new material, boron hydride, was identified as a potential shielding material and more optimum combinations of TiH_2, B_4C, and W were identified as well.

31149 **TFCX shielding optimization.** Yang, S.; Gohar, Y. (Fusion Power-Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1012-1019(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Design analyses and tradeoff studies for the bulk shield of the Tokamak Fusion Core Experiment (TFCX) were performed. Several shielding options were considered to lower the capital cost of the shielding system. Optimization analyses were carried out to reduce the nuclear responses in the TF coils and the dose equivalent in the reactor hall one day after shutdown. Two TFCX de-

signs with different toroidal field (TF) coil configurations were considered during this work. The materials for the shield were selected based upon tradeoff studies and the results from the previous design studies. The main shielding materials are water, concrete, and steel balls (Fe1422 or Nitronic 33). Small amounts of boron carbide and lead are employed to reduce activation, nuclear heating in the TF coils, and dose equivalent after shutdown.

31150 **Shield design for next-generation, low-neutron-fluence, superconducting tokamaks.** Lee, V.D.; Gohar, Y. (Fusion Engineering Design Center/McDonnell Douglas Astronautics Company, Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1001-1005(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A shield design using stainless steel (SST), water, boron carbide, lead, and concrete materials was developed for the next-generation tokamak device with superconducting toroidal field (TF) coils and low neutron fluence. A device such as the Tokamak Fusion Core Experiment (TFCX) is representative of the tokamak design which could use this shield design. The unique feature of this reference design is that a majority of the bulk steel in the shield is in the form of spherical balls with two small, flat spots. The balls are purchased from ball-bearing manufacturers and are added as bulk shielding to the void areas of builtup, structural steel shells which form the torus cavity of the plasma chamber. This paper describes the design configuration of the shielding components.

31151 **First wall and blanket design for a high wall loading compact tokamak power reactor.** Sviatoslavsky, I.N.; Abdel-Khalik, S.I.; Corradini, M.L.; El-Afify, M.; Huh, K.Y.; Kuleinski, G.L.; Wittenberg, L.J. (Fusion Technology Institute, University of Wisconsin-Madison, Madison, WI). *Fusion Technology;* 8: No. 1, 980-985(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Among the specific limitations which tend to complicate a compact high wall loading (HWL) tokamak reactor design are high surface and nuclear heating, compactness leading to crowded components, unlikely breeding on the inboard side and frequent first wall/blanket replacement. This paper describes the mechanical, thermal hydraulic and tritium aspects of an improved blanket design for a high β (20%), high wall loading (R 10 MW/m^2) compact fusion power reactor of 1000 MW /sub th/ power output.

31152 **A module for testing a lithium cooled tokamak blanket in a tandem mirror test reactor.** Garner, J.K.; Blanchard, J.; Madarame, H.; Orient, G.; Shin, K.; Taghavi, K.; Tillack, M.; Youssef, M. (TRW, Redondo Beach, CA). *Fusion Technology;* 8: No. 1, 962-967(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A preliminary conceptual design was made of a test module for testing the BCSS lithium cooled, vanadium structure blanket concept in a tandem mirror fusion test reactor. The test module is intended to run at the correct stresses and temperatures of a segment of the blanket, while operating at reduced neutron wall loadings. Although this approach ties the effort to a single design and its issues, it tends to reveal interactions that might not be apparent if a more general approach were taken, and can lead to some useful general conclusions.

31153 **Impurity control and vacuum pumping system design and analysis for next-generation tokamaks.** Haines, J.R. (Fusion Engineering Design Center/Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1259-1268(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Impurity control system design and performance studies were performed in support of the Tokamak Fusion Core Experiment (TFCX) preconceptual design. Efforts concentrated on the pumped limiter and vacuum pumping system design configuration, thermal/mechanical and erosion lifetime performance of the limiter protective surface, and helium ash removal performance. Analysis results indicate that the limiter/vacuum pumping system design provides marginally adequate helium ash removal. Difficulties in providing adequate helium ash removal for more compact or higher fusionpower-density devices are addressed. Erosion, primarily by disruption-induced vaporization and/or melting, limits the protective surface lifetime to about one calendar year or only about 60 full-power hours of operation. In addition to evaluating impurity control system performance for nominal TFCX conditions, these studies attempt to focus on the key plasma physics and engineering design issues that should be addressed in future research and development programs.

31154 **Measurements and calculations of the leakage multiplication from hollow beryllium spheres.** Wong, C.; Bauer, R.W.; Haight, R.C.; Hansen, R.C.; Howerton, R.J.; Komoto, T.T.; Lee, J.D.; Perkins, S.T.; Plechaty, E.F.; Pohl, B.A. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1165-1173(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Using the Pulsed-Sphere Method, the leakage spectra from hollow Be spheres of 4.5, 13.8 and 19.9 cm thickness have been measured. The predicted copious production of epithermal and thermal neutrons from the 13.8 and 19.9 cm spherical shells has been verified. A quantitative comparison of measured and calculated time-of-arrival count spectra over the energy range from thermal to $\int$ 15 MeV indicates that the ENDL-84 library overestimates the leakage spectra between 2 and 10 MeV and in the epithermal and thermal energy regions. In the remaining regions, the leakage spectra are underestimated. Because of the above compensation the inferred leakage multiplication for the 19.9 cm Be is $\int$ 3% higher than calculations. In the case of the 13.8 cm Be, the compensation is less exact and the inferred leakage multiplication is $\int$ 9% higher than calculations.

31155 **MFTF-α+T shield design.** Gohar, Y. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1330-1338(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

MFTF-α+T is a DT upgrade option of the Tandem Mirror Fusion Test Facility (MFTF-B) to study better plasma performance, and test tritium breeding blankets in an actual fusion reactor environment. The central cell insert, designated DT axicell, has a 2-MW/m^2 neutron wall loading at the first wall for blanket testing. This upgrade is completely shielded to protect the reactor components, the workers, and the general public from the radiation environment during operation and after shutdown. The shield design for this upgrade is the subject of this paper including the design criteria and the tradeoff studies to reduce the shield cost.

31156 **Neutronics scaling in fusion test devices.** Shin, K.; Youssef, M.Z. (University of California, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 1443-1448(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A scaling factor for the neutronics parameters of the first wall was derived as a function of the plasma and first wall radii of fusion devices based on the simple albedo concept. The derived equation followed very well the scaling behavior of the heating rate and DPA obtained by ANISN as the device size was changed. The helium and hydrogen production rates were scaled with the rate /phi/ /sup uncol/ / J /sup uncol/. A simple expression for the azimuthal distribution of neutronics parameters in the first wall was derived. The applicability of the expression was verified by comparing the heating rate profiles given by the equation with those by Monte Carlo calculations in the first two different shapes.

31157 Experimental techniques and measurement accuracies. Bennett, E.F.; DiLorio, G.; Maekawa, H.; Nakamura, T.; Yule, T.J. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1535-1541(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A brief description of the experimental tools available for fusion neutronics experiments is given. Attention is paid to error estimates mainly for the measurement of tritium breeding ratio in simulated blankets using various techniques.

31158 Engineering scaling and quantification of the test requirements for fusion nuclear technology. Gierszewski, P.; Abdou, M.; Bell, G.; Billone, M.; Blanchard, J.; Garner, J.; Madarame, H.; Orient, G.; Shin, K.; Taghavi, K. (University of California at Los Angeles, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 1101-1108(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

For integrated testing of fusion nuclear components, it is likely that the test device parameters will not match the device parameters of a full scale fusion reactor because of cost constraints. This will result in changes in the behavior of the test module and limit the ability of the test to resolve key nuclear issues. However, it may be possible to modify the test module in order to retain the important aspects of the issues over a range of test device parameters. In order to understand and quantify this range and set requirements for blanket testing, analyses of several aspects of blanket operation were performed. The results suggest that a useful integrated test device should have at least 1 MW/m^2 neutron wall load, 0.2 MW/m^2 surface heat flux, 20% availability, 500 s burn length, and 0.5 m^2 by 0.3 m per test module.

31159 Flow characteristics of the Cascade granular blanket. Pitts, J.H.; Walton, O.R. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1838-1843(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Analysis of a single granule on a rotating cone shows that for the 35° half-angle, double-cone-shaped Cascade chamber, blanket granules will stay against the chamber wall if the rotational speed is 50 rpm or greater. The granules move axially down the wall with a slight (5-mm or less) sinusoidal oscillation in the circumferential direction. Granule chute-flow experiments confirm that two-layered flow can be obtained when the chute is inclined slightly above the granular material angle of repose. The top surface layer is thin and fast moving (supercritical flow). A thick bottom layer moves more slowly (subcritical flow controlled at the exit) with a velocity that increases with distance from the bottom of the chute. This is a desirable velocity profile because in the Cascade chamber about one-third of the fusion energy is deposited in the form of x rays and fusion-fuel-pellet debris in the top surface (inner-radius) layer.

31160 Tritium breeding material : o $LiAlO_2$. Rasneur, B. (CEA - CEN/SACLAY - IRDI/DESICP/DPC, Gif sur Yvette). *Fusion Technology;* 8: No. 1, 1909-1914(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Very homogeneous microtextures of porous $LiAlO_2$ have been prepared in a large range of porosity and elementary grain diameter in order to determine more easily the T_2 diffusion coefficient in the solid and optimize the best microstructure for the blanket. From this large field of homogeneous microstructures, empirical equations describing the properties of these porous bodies have been deduced, as a function of porosity, grain diameter and temperature, for instance : ultra sound velocity, Young's modulus, ultimate compressive strength, creep, thermal shock and electrical conductivity.

31161 An impurity control test facility (ICTF) for the study of fusion reactor/plasma edge materials. Brooks, J.N.; Ehst, D.A.; Hershkowitz, N.; Mattas, R.F. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1766-1771(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A test facility has been designed for investigating many of the impurity control issues associated with fusion reactors. The facility is a steady-state, RF-stabilized mirror with high field and high pumping capability end cells. Analysis indicates that the ICTF should readily produce a plasma with typical parameters of N /sub e/ = 3 x 10^{18} m^{-3}, T /sub e/ = 50 eV, and T /sub i/ = 100 eV at each end cell. A heat load of about 2 MW/m^2 over areas of about 1600 cm^2 could be produced at each end with 800 kW of ICRH power. These conditions would provide a unique capability for examining issues such as erosion/redeposition behavior, properties of redeposited materials, high recycling regimes, plasma edge operating limits for high-Z materials, and particle pumping efficiencies for limiter and divertor designs.

31162 Blanket optimization studies for cascade. Meier, W.R.; Morse, E.C. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1826-1831(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A nonlinear, multivariable, blanket optimization technique is applied to the Cascade inertial confinement fusion reactor concept. The thickness of a two-zone blanket, which consists of a BeO multiplier region followed by a $LiA10_2$ breeding region, is minimized subject to constraints on the tritium breeding ratio, neutron leakage, and heat generation rate in Al/SiC tendons that support the chamber wall.

31163 Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications. Brooks, J.N.; DeWald, A.B.; Gruen, D.M.; Krauss, A.R.; Mattas, R.F. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1275-1280(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A new approach to impurity control involves the development of materials displaying both strong surface segregation of a low-Z component and high secondary ion fractions in the sputtering of that component. Key issues that have been studied with particular reference to copper-lithium alloys relate to the completeness of the overlayer, its rate of formation in a reactor environment, lowering of substrate sputtering and self-sputtering yields, durability of the overlayer, and depletion of the bulk alloy in the low-Z component. Other factors that must be considered in the materials selection process relate to response to disruptions, heat transfer, thermal stress, fabricability, radiation damage, activation, and tritium permeation. Copper-lithium alloys have been evaluated as a surface material for the impurity control system of the INTOR reactor. Both the medium-edge temperature limiter regime and the low-edge temperature divertor regime were examined. The analysis used TRIM code data to predict sputtering coefficients for copper-lithium with a 1.5 monolayer coverage of lithium. The REDEP code was used to evaluate the erosion performance for INTOR.

31164 The Felix experiments: measurements of electromagnetic effects. Turner, L.R.; Evans, K.; Gunderson, G.R.; Kim, S.; Knott, M.J.; McGhee, D.G.; Praey, W.F.; Wehrle, R.B. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 2, 227-232(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Three major series of experiments have been conducted with the FELIX facility at ANL. Experiments on the coupling between eddy currents and angular displacements of loops and plates in crossed constant and changing magnetic fields demonstrated that the coupling effects reduced the peak currents and deflections.

These experiments were carried out by a team of investigators from Princeton Plasma Physics Laboratory (PPPL) and ANL and are reported elsewhere. Experiments measuring eddy current effects in flat plates provided data to validate 2-D and 3-D eddy current computer codes. Experiments measuring eddy current effects in hollow cylinders with different ratios of thickness to diameter explored the limitations of using 2-D codes to model 3-D geometries. The plate and cylinder experiments are described in detail.

31165 **System studies of commercial Tokamak reactors with resistive magnets.** Le Claire, R.J.; Bomberg, L.; Cohn, D.R.; Potok, R.E.; Yang, T.F. (MIT Plasma Fusion Center, Cambridge, MA). *Fusion Technology;* 8: No. 1, 327-331(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Scoping studies were performed to evaluate the potential of resistive magnet tokamaks for commercial electricity producing applications. Attractive options have been identified which are characterized by moderate wall loading, low field, moderate recirculating power, moderate to high toroidal β, compact nuclear islands and costs competitive with those of comparable superconducting options. Resistive magnet commercial tokamaks operating in the second region of stability in β appear particularly attractive. Several methods are investigated here for achieving second stability, including hot electron and hot ion stabilization of the MHD modes during start-up.

31166 **TFCX current density and nuclear heating limitations for superconducting Tokamaks.** Kalsi, S.S. (Fusion Engineering Design Center/Grumman Aerospace Corporation, Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 344-349(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A major goal of the Tokamak Fusion Core Experiment (TFCX) study was to minimize the size of the device and achieve lowest cost. Two key factors influencing the size of the device employing superconducting magnets are toroidal field (TF) winding current density and its nuclear heat load withstand capability. Lower winding current density requires larger radial build of the winding pack. Likewise, lower allowable nuclear heating in the winding requires larger shield thickness between the plasma and coil. To achieve a low-cost device, it is essential to maximize the winding's current density and nuclear heating withstand capability. To meet this objective, the TFCX design specification adopted as goals a nominal winding current density of 3500 A/cm^2 with 10-T peak field at the winding, peak nuclear heat load limits of 1 mW/cm^3 for the nominal design and 50 mW/cm^3 for an advanced design. This study developed justification for these current density and nuclear heat load limits.

31167 **The role of fusion reaction products in the stability of EBT reactors.** Wojtowicz, D.; Kammash, T. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 637-640(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The potential of the EBT plasma confinement device as a fusion reactor depends critically on its ability to support a sufficiently large power density which in turn means a large enough beta defined as the ratio of the plasma pressure to magnetic field pressure. The maximum allowable beta is generally dictated by the stability of the system to hydromagnetic (MHD) modes. In this paper we examine the stability of such modes for a D-T plasma and assess the effect of the alpha particles on these instabilities. We find that the alphas have the most destabilizing effect, as reflected in the drop of the ion beta, at the instant of birth and that recovery of stability is achieved as the alphas approach equilibration with the ions of the plasma. In short, there appears to be no serious adverse effects on the reactor beta resulting from alpha-induced instabilities.

31168 **Plasma engineering for MINIMARS: a small commercial tandem mirror reactor with octopole plugs.** Perkins, L.J.; Blackfield, D.T.; Campbell, R.B.; Devoto, R.S.; Johnston, B.H.; Logan, B.G. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). *Fusion Technology;* 8: No. 1, 685-692(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

With the employment of a novel octopole end plug scheme, we examine the plasma engineering design of MINIMARS, a small compact fusion reactor based on the tandem mirror principle. With a net electric output of 600 MW /sub e/, MINIMARS is expressly designed for short construction times, factory built modules, and a passively safe blanket system. We show that the compact octopole/mantle provides several distinct improvements over the more conventional quadrupole (yin-yang) end plugs and enables ignition to be obtained with much shorter central cell length. In this way we can design economic small reactors which will minimize utility financial risk and provide attractive alternatives to the conventional larger fusion plants encountered to date.

31169 **Design of aggressive superconducting TFCX magnet systems.** Miller, J.R. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). *Fusion Technology;* 8: No. 1, 829-837(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

An investigation of several fundamental limits of machine design indicate that a machine fitting the specifications of the Tokamak Fusion Core Experiment (TFCX) can be built with both a superconducting toroidal field (TF) coil set and a plasma major radius of less than 3.2 m. This small size is achieved by accepting a peak nuclear heat load of 50 kW°m^{-3} in the TF coil inner leg while operating at a 10-T maximum field with a current density of 35 A°mm^{-2} in the winding pack. This performance, high by traditional standards, is justified based on developments in forced flow conductor technology using Nb_3Sn composite superconductors.

31170 **Experience with operation of a large magnet system in the international fusion superconducting magnet test facility.** Fietz, W.A.; Ellis, J.F.; Haubenreich, P.N.; Schwenterly, S.W.; Stamps, R.E. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 817-822(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Superconducting toroidal field systems, including coils and ancillaries, are being developed through international collaboration in the Large Coil Task. Focal point is a test facility in Oak Ridge where six coils will be tested in a toroidal array. Shakedown of the facility and preliminary tests of the first three coils (from Japan, Switzerland, and the U.S.) were accomplished in 1984. Useful data were obtained on performance of the helium refrigerator and distribution system, power supplies, control and data acquisition systems and voltages, currents, strains, and acoustic emission in the coils. Performance was generally gratifying except for the helium system, where improvements are being made.

31171 **Partial-array test results in IFSMTF.** Lue, J.W.; Dresner, L.; Koizumi, K.; Lubell, M.S.; Luton, J.N.; Shen, S.S.; Zahn, G.R.; Zichy, J.A. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 807-816(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Preliminary performance tests of two large super conducting magnets have been carried out in the International Fusion Superconducting Magnet Test Facility (IFSMTF). Each of the Japanese (JA) and General Dynamics/Convair (GD) coils was operated up to its full design current of 10.2 kA with the other serving as an adjacent background coil at 40% of design current. Cryostatic stability was demonstrated for both coils by noting recovery from a full half-turn (5 m) driven normal. A new pick-up coil compensation scheme was successfully used for the quench detection system.

Each coil remained superconducting when the other was dumped. Unique instrumentation was used to measure changes in bore dimensions and displacement of the winding from the coil case. Agreement between structural analysis and measurement of bore dimension changes resulting from magnetic loads is good. The Swiss (CH) coil underwent only a cryogenic test. The forced cooling worked well and an inlet temperature of 3.8 K was demonstrated.

31172 **A demountable toroidal field coil system for a commercial tokamak reactor.** Yang, T.F.; Bobrov, E.S.; Bomberg, L.; Cohn, D.R.; LeClaire, R.J.; Williams, J.E.C. (MIT Plasma Fusion Center, Cambridge, MA). *Fusion Technology;* 8: No. 1, 838-842(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A conceptual design for a demountable TF coil is presented. The work is being pursued as part of an ongoing study of the Resistive Magnet Commercial Tokamak Reactor (RCTR) at MIT. The RCTR is an attractive commercial tokamak option which utilizes resistive magnets characterized by low stresses, low current density and moderate dissipated power. The demountable coil design for RCTR presented here features a relatively simple configuration with a large cross-section available for current transfer in the joint. The concept allows for complete removal of the TF coil with the blanket/first wall in place. Analysis also indicates significant advantages for the overall RCTR concept due to the possibility of placement of the EF and OH coils within the TF bore. These advantages include reduced PF coil size, dissipated power and TF overturning.

31173 **Compact minimum cost ignition test reactor.** Cohn, D.R.; Bell, G.; Berwald, D.; Bobrov, E.; Bromberg, L.; Kohse, G.; Listvinsky, G.; Wagner, C.; Williams, J.E.C.; Witt, R. (MIT Plasma Fusion Center, Cambridge, MA). *Fusion Technology;* 8: No. 1, 1291-1296(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

In this paper we describe a design of an ignition test reactor based on the LITE concept. The main objective of the device is to study key physics issues of ignited plasma operation. LITE-type devices are characterized by toroidal field coils of plate magnet construction. The plates form a continuous structure in the throat of the magnet. The inplane loads are supported by the conductor, while the out-of-plane loads are supported by external frames. The magnet is designed for operation at relatively high stresses and magnetic fields. There is little or no shielding between the vacuum vessel and the magnet. This type of design results in a compact machine.

31174 **Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket.** Davidson, J.W.; Battat, M.E.; Dudziak, D.J. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1503-1510(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A detailed two-dimensional nucleonic analysis was performed for a conceptual first wall, blanket, and shield design for the Compact Reversed-Field Pinch Reactor. The design includes significant two-dimensional aspects presented by the limiter, vacuum ducts, and coolant manifolds; these aspects seriously degrade the tritium-breeding reaction (TBR) predicted by one-dimensional calculations. A range of design change to increase the TBR were investigated within the two-dimensional analysis. The results of this investigation indicated that an adequate TBR could be achieved with a thinner copper first wall, a ^{6}Li enrichment near 90%, the proper selection of reflector, and a small addition to the blanket thickness, determined by the one-dimensional analysis.

31175 **Fusion-power-core design of a compact Reversed-Field Pinch Reactor (CRFPR).** Copenhaver, C.; Battak, M.E.; Cappiello, C.; Chaffee, A.D.; Davidson, J.W.; Hayenson, R.L.; Krakowski, R.A.; Lujan, R.E.; Mynard, R.C.; Schnurr, N.M. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1590-1595(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A conceptual design of a fusion power core (FPC, i.e., plasma chamber, first wall, blanket, shield, coils) based on a Reversed-Field Pinch (RFP) has been completed. After a brief statement of rationale and description of the reactor configuration, the FPC integration is described in terms of power balance, thermal-hydraulics, and mechanical design. The engineering versatility, promise, and problems of this high-power-density approach to fusion are addressed.

31176 **A comparison study of toroidal-field divertors for a Compact Reversed-Field Pinch Reactor.** Bathke, C.G.; Krakowski, R.A.; Miller, R.L. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1616-1624(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Two divertor configurations for the Compact Reversed-Field Pinch Reactor (CRFPR) based on diverting the minority (toroidal) field have been reported. A critical factor in evaluating the performance of both poloidally symmetric and bundle divertor configurations is the accurate determination of the divertor connection length and the monitoring of magnetic islands introduced by the divertors, the latter being a three-dimensional effect. To this end the poloidal-field, toroidal-field, and divertor coils and the plasma currents are simulated in three dimensions for field-line tracings in both the divertor channel and the plasma-edge regions. The results of this analysis indicate a clear preference for the poloidally symmetric toroidal-field divertor. Design modifications to the limiter-based CRFPR design that accommodate this divertor are presented.

31177 **Status of the ZT-40M RFP experimental program.** Massey, R.S.; Baker, D.A.; Buchenauer, C.J.; Burkhardt, L.C.; Cayton, T.; Di Marco, J.N.; Downing, J.N.; Erickson, R.; Watt, R.G.; Weber, P.G. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1571-1580(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The present status of research on the ZT-40M Reversed-Field Pinch (RFP) will be described. RFP discharges have been sustained for times (27 ms) >> the classical resistive diffusion time, implying the existence of a flux-sustainment mechanism ("dynamo"). This mechanism opens the possibility for a steady-state RFP reactor utilizing a unique form of non-inductive current drive. T /sub e/ > 500 eV has been obtained for 400 kA discharges with $\bar{n}$ /sub e/ about 4 x 10^{19} m^{-3}. Total energy confinement time / tau/ /sub E/ has reached 0.7 ms with a Lawson parameter of 5 x 10^{16} m^{-3}s for discharges with $\bar{n}$ /sub e/ = 8 x 10^{19} m^{-3} and T / sub e/ = 330 eV at a plasma current of 330 kA and 0.33 T total confining field at the wall. Reactor-like $\beta\theta$ about 10-20% is routinely obtained for plasma currents from 60-400 kA (β about $\beta\theta/2$). Scaling of $\bar{n}$ /sub e/ /tau/ /sub E/ about I /sup 2.2+or-0.4/ is found, more than adequate for a compact RFP reactor.

31178 **Recent progress in stellarator reactor conceptual design.** Miller, R.L. (University of California, Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1581-1589(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Stellarator/Torsatron/Heliotron (S/T/H) class of toroidal magnetic fusion reactor designs continues to offer a distinct and in several ways superior approach to eventual commercial competitiveness. Although no major, integrated conceptual reactor design activity is presently underway, a number of international research efforts suggest avenues for the substantial improvement of the S/T/H reactor embodiment, which derive from recent experimental and theoretical progress and are responsive to current trends in fusion-reactor projection to set the stage for a "third generation" of designs. Recent S/T/H reactor design activity is reviewed and the impact of the changing technical and programmatic context on the direction of future S/T/H reactor design studies is outlined.

31179 **Steady-state spheromak reactor studies.** Hagenson, R.L.; Krakowski, R.A. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1606-1612(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

After summarizing the essential elements of a gun-sustained spheromak, the potential for a steady-state reactor is explored by means of a comprehensive physics/engineering/costing model. A range of cost-optimized reactor design points is presented, and the sensitivity of cost to key physics, engineering, and operational variables is reported.

31180 **Magnetics calculations for an ELMO Bumpy Square.** Santoro, R.T.; Schmitt, R.J.; Uckan, N.A. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1659-1663(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Calculations have been carried out to determine the vacuum magnetic parameters, forces, and the use of trim coils in an ELMO Bumpy Square. A configuration having five mirror coils per side and an eight-coil high-field toroidal solenoid corner assembly was studied. Favorable magnetic parameters are achieved in the device. An on-axis mirror ratio of 1.9, a global mirror ratio of 3.6, and excellent centering of plasma pressure contours are achieved. Particle losses are also minimal (<5%). The magnetic forces acting between coils are comparable with those encountered in the EBT-I/S magnet configuration. Circular trim coils were found to be suitable for restoring hot electron ring locations that are displaced when the coil currents are varied for performing magnetic studies or for assessing the effects on the EBS of the global mirror ratio.

31181 **Assessment of magnetic field asymmetries in ELMO Bumpy Square.** Uckan, T.; Uckan, N.A. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1664-1669(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

There exist two separate and independent magnetic field asymmetries in the ELMO Bumpy Square (EBS). One is associated with the small perturbations in the magnetic field, known as the field errors, caused by coil misalignments during installation, imperfection in coil winding, etc. The second source of asymmetry is the magnetic field ripple in the high-field toroidal solenoids (corners) produced by the finiteness of the number of coils. In general, these two sources of asymmetry introduce enhanced transport losses (in addition to other effects) to the system, although they affect different classes of particles. Toroidally passing (circulating) particles are influenced by the field errors, whereas trapped particles in the corners are influenced by the field ripple. In this paper we discuss these two effects separately and calculate the allowable magnitudes of the field error and field ripple in EBS, both for an experimental-size device and for a reactor.

31182 **Magnetic ripple correction in tandem mirrors by ferromagnetic inserts.** Hamilton, G.W. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1670-1675(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Magnetic ripple of 1% or more caused by discrete solenoid coils in the central cells of tandem mirrors may severely affect the MHD stability. The ripple amplitude can be reduced by an order of magnitude by ferromagnetic annuli inserted within the coils at the regions of ripple maxima. The inserts need not affect the accessibility, coil diameter, or capital cost, since large quantities of steel are required within the coils for the neutron blanket and shield. Design of the ripple correction is simplified and linearized by the cylindrical geometry and by the saturation of the ferromagnetic steel.

31183 **Hot spots in the inboard section of the TFCX toroidal field coils.** Yung, S.; Gohar, Y. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1682-1687(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The TFCX conceptual designs call for the construction of the reactor torus through the use of "pie-shaped" segments for mechanical and maintenance considerations. The use of this concept results in hot spots in the inboard section of the torodial field (TF) coils due to neutron and photon streaming through the slots between the segments. This work studies these effects on the nuclear responses in the TF coils and introduces design solutions to reduce the impact on the reactor design.

31184 **Octopole design concepts for the mirror end cell.** Kalsi, S.S. (Fusion Engineering Design Center/Grumman Aerospace Corporation, Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1703-1707(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A goal of minimum cost was pursued very strongly by the mirror project team. The team has concluded that a more compact and cost-effective end cell magnet system could be achieved by employing octopole magnets. Feasibility of an octopole end cell magnet design was studied as part of FY84 Fusion Power Demonstration (FPD) work under the direction of Lawrence Livermore National Laboratory (LLNL). This paper describes sizing and design studies of a superconducting octopole magnet. Magnetic field requirements were supplied by LLNL for the end cell region. Based on these requirements, the Fusion Engineering Design Center (FEDC) synthesized an end cell magnet system. The final end cell magnet system at the conclusion of the FPD study consisted of a 24-T choke coil, a small octopole, a large octopole, and a mirror circular coil. Many octopole magnet configurations were studied, but the final large octopole design consisted of four saddle coils. The saddle-shaped coils were preferred over other shapes for ease of fabrication. The paper describes the scoping design study of the saddle coil winding and its support structure. The support concept for interconnecting the four saddle coils (to form the octopole) is described. An octopole consisting of saddle coils can be fabricated using current conductors and coil winding technology.

31185 **Transient voltage oscillations in coils.** Chowdhuri, P. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1708-1716(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Magnet coils may be excited into internal voltage oscillations by transient voltages. Such oscillations may electrically stress the magnet's dielectric components to many times its normal stress. This may precipitate a dielectric failure, and the attendant prolonged loss of service and costly repair work. Therefore, it is important to know the natural frequencies of oscillations of a magnet during the design stage, and to determine whether the expected switching transient voltages can excite the magnet into high-voltage internal oscillations. The series capacitance of a winding significantly affects its natural frequencies. However, the series capacitance is difficult to calculate, because it may comprise complex capacitance network, consisting of intra- and inter-coil turn-to-turn capacitances of the coil sections. A method of calculating the series capacitance of a winding is proposed. This method is rigorous but simple to execute. The time-varying transient voltages along the winding are also calculated.

31186 **Impact of a poloidal divertor in ignition tokamak design.** Strickler, D.J.; Brown, T.G.; Dabiri, A.E.; Lee, V.D.; Miller, J.B.; Peng, Y.-K.M. (FEDC/Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1753-1759(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

System design studies were performed to assess the effect of assuming a poloidal divertor instead of a limiter as a means of impurity control for ignition tokamak configurations. Results show that for the nominal Tokamak Fusion Core Experiment (TFCX) device with superconducting TF coils, a feasible poloidal divertor configuration can be obtained without increasing the major radius.

In the TFCX nominal copper TF coil device, however, field limits at the PF coils are exceeded when the effects of asymmetry associated with a poloidal divertor are included. It was found that a 12% increase in the major radius of this device is necessary to simultaneously satisfy the plasma-shaping requirements of a poloidal divertor and the magnetics constraints at the superconducting PF coils.

31187 **Multivariable current control for electrically and magnetically coupled superconducting magnets.** Owen, E.W.; Shimer, D.W. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1801-1806(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Superconducting magnet systems under construction and projected for the future contain magnets that are magnetically coupled and electrically connected with shared power supplies. A change in one power supply voltage affects all of the magnet currents. A current controller for these systems must be designed as a multivariable system. The paper describes a method, based on decoupling control, for the rational design of these systems. Dynamic decoupling is achieved by cross-feedback of the measured currents. A network of gains at the input decouples the system statically and eliminates the steady-state error. Errors are then due to component variations. The method has been applied to the magnet system of the MFTF-B, at the Lawrence Livermore National Laboratory.

31188 **Modeling and optimization of a test-cell upgrade for MFTF-B operating in the high neutron wall loading mode.** Fenstermacher, M.E. (TRW Inc., Redondo Beach, CA). *Fusion Technology;* 8: No. 1, 1318-1323(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Models of the plasma particle and power balances in a tandem mirror with a high-field test-cell insert in the central cell have been used to calculate operating points for test-cell upgrades of the MFTF-B configuration. The code results have been benchmarked against the proposal plasma parameters for the MFTF-α+T configuration operating in the high neutron wall loading mode. Some parametric studies have been done. Using the results from these parametrics an optimized set of operating parameters for an MFTF-α+T-like configuration with a test-cell which will accommodate two 1.5 m long blanket test modules has been generated. This operating point has the same test-cell neutron wall loading as the original configuration and lower input powers to other systems in the device. The neutral beam power per unit blanket module length is also somewhat reduced in the optimized case.

31189 **Fragmentation of suddenly heated liquids in ICF reactors.** Blink, J.A.; Hoover, W.C. (Lawrence Livermore National Laboratory and University of California at Livermore-Davis, Livermore, CA). *Fusion Technology;* 8: No. 1, 1844-1849(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Fragmentation of free liquids in Inertial Confinement Fusion reactors could determine the upper bound on reactor pulse rate because increased surface area will enhance the cooling and condensation of coolant ablated by the fusion x rays. Relaxation from the suddenly (neutron) heated state will move a liquid into the negative pressure region under the liquid-vapor P-V dome. The resulting expansion in a diverging geometry will hydrodynamically force the liquid to fragment, with vapor then forming from the new surfaces to fill the cavities. An energy minimization model is used to determine the fragment size that produces the least amount of non-fragment-center-of-mass energy; i.e., the sum of the surface and dilational kinetic energies. This model predicts fragmentation dependence on original system size and amount of isochoric heating as well as liquid density, Gruneisen parameter, surface tension, and sound speed. A two dimensional molecular dynamics code was developed to test the model at a microscopic scale for the Lennard-Jones fluid with its two adjustable constants chosen to represent lithium. The numerical experiments produced reasonable agreement with the model. Considerable fragmentation is predicted in the high energy density HYLIFE reactor, with minimum fragmentation in other (low energy density) reactors.

31190 **Liquid to gas leak ratios with liquid nitrogen and liquid helium.** Batzer, T.H.; Call, W.R. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1281-1283(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

To predict the leak rates of liquid helium and liquid nitrogen containers at operating conditions we need to know how small leaks (10^{-8} to 10^{-5} atm-cm^3 air/s), measured at standard conditions, behave when flooded with these cryogens. Two small leaks were measured at ambient conditions (about 750 Torr and 295 K), at the normal boiling points of LN_2 and LHe, and at elevated pressures above the liquids. The ratios of the leak rates of the liquids at ambient pressure to the gases at ambient pressure and room temperature are presented. The leak rate ratio of LN_2 at elevated pressure was linear with pressure. The leak rate ratio of LHe at elevated pressure was also linear with pressure.

31191 **Material and electromagnetic properties of Faraday shields for ion cyclotron heating antennas.** Hoffman, D.J.; Baity, F.W.; Becraft, W.R.; Caughman, J.B.O.; Tsai, C.C. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 392-399(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Faraday shields for ion cyclotron antennas must transmit magnetic waves and absorb little RF power. To investigate these properties, we have constructed 27 Faraday shields in many configurations, including chevrons, tubes, straps, concentric rings, various layered shields, conventionally leafed straps, and replicas of the Faraday shields for ASDEX, the Joint European Torus (JET), TEXTOR, and Alcator-C. We have measured the magnetic flux and observed loading at various operating resistances by using dielectric sheets or magnetic-coupled loads. Each Faraday shield effects a net change in the characteristic inductance of the antenna, resulting in a reduction of wave coupling. However, the load experienced by the antenna is not always reduced because the Faraday shield itself acts as a load. We differentiate between these effects experimentally. The net result of the study is that the Faraday shields now in use cost up to a factor of 50% of coupling. This, of course, reduces the power handling capability by 50% as well. However, configurations exist that are easily cooled and result in a reduction of less than 5% in loading.

31192 **Radio frequency vacuum feedthroughs for high-power ICRF heating applications.** Owens, T.L.; Baity, F.W.; Hoffman, D.J.; Whealton, J.H. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 381-386(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Frequently, high-power pulsed ion cyclotron range of frequency experiments are limited by breakdown at the vacuum feedthrough. This paper describes the development and testing of vacuum feedthroughs to increase both reliability and capability. The ultimate goal of the program is to develop a continuous-wave feedthrough for the next generation of fusion experiments. A feedthrough concept currently under investigation consists of a simple, cylindrical alumina ceramic brazed between tapered coaxial conductors. A prototype has been tested to voltage levels in excess of 100 kV for 100-ms pulses and 70 kV for 5-s pulses at 28 MHz. Insertion-voltage-standing-wave ratios are $<$1.15:1 for frequencies below 450 MHz. An upgraded water-cooled version being fabricated for use on TEXTOR will be described.

31193 **Experimental measurements of the ion cyclotron antennas' coupling and RF characteristics.** Hoffman, D.J.; Baity, F.W.; Becraft, W.R.; Caughman, J.B.O.; Owens, T.L. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 411-419(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Ion cyclotron resonance heating (ICRH) is expected to become the dominant contributor to the supplemental heating needs of plasmas in future toroidal devices. The severity of the environ-

ments that will be imposed on the ICRH antennas by the plasma in such devices requires the investigation of different approaches to providing adequate life and reliability in addition to the necessary coupling. This work, which is part of the National Ion Cyclotron Heating Program, addresses these issues. The rf coupling capabilities and characteristics of various antennas have been measured. The tested antenna configurations include the simple loop antenna operated at resonant lengths as used on Alcator-C, the cavity antenna proposed for Doublet III-D, and the resonant double loop, asymmetric resonant double loop, and U-slot antennas. Models of the voltage, magnetic fields outside the structure, and current have been correlated with the measurements made on these antennas. From these measurements and from typical observations of ICRH coupling in tokamaks, we are studying power and frequency limitations on each antenna and the causes of the limitations. A comparison of the technology, performance, and power limitations of each type of antenna is presented.

31194 **The Advanced Toroidal Facility (ATF).** Thompson, P.B. (Oak Ridge National Laboratory, Fusion Energy Division, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 450-458(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Advanced Toroidal Facility (ATF) is a new magnetic plasma confinement device, under construction at Oak Ridge National Laboratory (ORNL), which will lead to improvements in toroidal magnetic fusion reactors. ATF is a type of stellarator known as a torsatron which theoretically has the capability to operate at ≧8% beta in steady state. The ATF plasma has a major radius of 2.1 m, an average minor radius of 0.3 m, and a field of 2 T for a 5-s duration or 1 T steady state. The ATF device consists of a helical field (HF) coil set, a set of poloidal field (PF) coils, an exterior shell structure to support the coils, and a thin, helically contoured vacuum vessel inside the coils. The ATF replaces the ISX-B tokamak at ORNL and will use the ISX-B auxiliary systems, including 4 MW of neutral injection heating and 0.2 MW of electron cyclotron heating. ATF is scheduled to start operation in the fall of 1986. An overview of the ATF device is presented, including details of the construction process envisioned.

31195 **Materials problems for highly irradiated ICRH Launchers in fusion reactors.** El-Guebaly, A. (Fusion Technology Institute, University of Wisconsin, Madison, WI). *Fusion Technology;* 8: No. 1, 553-558(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The recent advances in radiofrequency (RF) heating have led to the use of substantial amounts of RF power for startup and heating. The RF heating system requires a number of ceramics for coaxial feedthrough insulation, antenna radomes, windows, and ceramic-filled waveguides. These dielectric materials should maintain electrical and structural integrity in a severe radiation and thermal environment. It is becoming more evident that the ceramic materials could be the weak point in the performance of the RF system, unless they are properly chosen.

31196 **Tritium technology review.** Finn, P.A.; Sze, D.K. (Chemical Technology Division, Fusion Power Program, Argonne National Laboratory, 9700 South Cass Avenue Argonne, IL). *Fusion Technology;* 8: No. 1, 693-706(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The methods used in recovering, containing and controlling tritium in fusion reactor systems are the subject of the paper. Safety, cost, and breeding needs for tritium control are outlined.

31197 **A comparison of burn cycle options for Tokamak reactors.** Ehst, D.A.; Brooks, J.N.; Cha, Y.; Evans, K.; Hassanein, A.M.; Kim, S.; Majumdar, S.; Misra, B.; Stevens, H.C. (Fusion Power Program, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL). *Fusion Technology;* 8: No. 1, 727-730(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Consideration of burn cycle options for commercial tokamaks shows that there is substantial motivation to achieve steady state operation. This is partly due to longer replacement periods for first wall and impurity control components, but, in addition, large cost savings are found when magnets, power supplies, and the energy transfer system are not frequently pulsed. The hybrid burn cycle, with a combination of ohmic and noninductive current drive, does not significantly improve the economics of ohmically-driven commercial reactors with large major radius. However, an INTOR-class device has a critically small hole in the doughnut, and we find for this size tokamak that the hybrid cycle is preferred over ohmically-driven operation.

31198 **Neutral beam heating system for TFTR.** Williams, M.D.; Eubank, H.P.; Grisham, L.R.; Kamperschroer, J.H.; Kugel, H.W.; Martin, G.D.; O'Connor, T.; Prechter, R.E.; Prichard, B.A.; Von Halle, A. (Plasma Physics Laboratory, Princeton University, Princeton, NJ). *Fusion Technology;* 8: No. 1, 800-806(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The first two neutral injection beamlines have been installed on TFTR and are now operational. The operation of six ion sources producing either hydrogen or deuterium beams at energies up to 80 kilovolts has produced notable plasma heating results. Eventual neutral beam capability on TFTR should provide the energy necessary to demonstrate breakeven.

31199 **Theory of feedthroughs: wave transmission and voltage characteristics of high-power current feeds for ICRH.** Whealton, J.H.; Baity, F.W.; Becraft, W.R.; Bell, M.A.; Bledsoe, J.L.; Goswitz, A.M.; Hoffman, D.J.; Owens, T.L.; Raridon, R.J. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 400-404(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Using circuit theory and solutions of a scalar twodimensional Laplace equation for the electrostatic potential, we examine various feedthroughs of interest for voltage holding, voltage standing wave ratio (VSWR) and impedance characteristics. Suitable inhomogeneous Dirichlet, scalar boundary conditions are imposed for the potentials for the calculation of the electrostatic fields. The inhomogeneous vector Newman boundary conditions on the surface of the dielectric are dispatched by use of a conformal mapping. Several feedthroughs are examined: old Princeton Large Torus (PLT), JULICH designs, and several Oak Ridge National Laboratory (ORNL) designs that have been actually fabricated and exhaustively tested. Some of these feedthrough configurations have been optimized to provide constant 50-Ω impedance or minimum VSWR.

31200 **An alpha particle diagnostic beam line system to generate an intense Li^0 beam with an ORNL SITEX source.** Dagenhart, W.K.; Stirling, W.L.; Tsai, C.C.; Whealton, J.H. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 387-391(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Oak Ridge National Laboratory (ORNL) SITEX (Surface Ionization with Transverse Extraction) negative ion source utilizes a 100-V/20-A reflex arc discharge in a 1300-gauss magnetic field to generate Cs^+ ions and H^+ or D^+ ions, depending on the beam required. A shaped molybdenum plate is placed directly behind the arc column. Cesium coverage on this plate is used to minimize the surface work function, which requires two-thirds of a monolayer coverage. Cesium coverage is adjusted both by cesium flow control into the arc discharge chamber and by temperature control of the converter using gaseous-helium cooling channels in the converter plate. Normal converter operational temperatures are 300° to 500°C. H^-/D^- beams are generated at the biased converter surface (-150 V with respect to the anode) by Cs^+ sputtering of absorbed hydrogen or deuterium and by the reflection-conversion mechanism of H^+/D^+ ions which strike the converter surface at 150 eV. The negative ions are accelerated through the 150-V plasma sheath at the converter surface and are focused by the converter geometry and magnetic field so as to pass through the exit aperture

with minimum angular divergence. The ion optics of the SITEX accelerator has been calculated using the ORNL 3-D optics code and results in a divergence perpendicular to the slot of θ rms = 0.35° and parallel to the slot of θ rms = 0.18°. This beam divergence should be adequate for injection into a radio frequency quadrupole (RFQ) for further acceleration.

31201 **Tritium Systems Test Assembly Quality Assurance Program.** Kerstiens, F.L. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 891-894(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A Quality Assurance Program should establish the planned and systematic actions necessary to provide adequate confidence that fusion facilities and their subsystems will perform satisfactorily in service. The Tritium Systems Test Assembly (TSTA) Quality Assurance Program has been designed to assure that the designs, tests, data, and interpretive reports developed at TSTA are valid, accurate, and consistent with formally specified procedures and reviews. The quality consideration in all TSTA activities is directed toward the early detection of quality problems coupled with timely and positive disposition and corrective action.

31202 **Tritium Systems Test Assembly operator training program.** Kerstiens, F.L. (Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 895-897(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Proper operator training is needed to help ensure the safe operation of fusion facilities by personnel who are qualified to carry out their assigned responsibilities. Operators control and monitor the Tritium Systems Test Assembly (TSTA) during normal, emergency, and maintenance phases. Their performance is critical both to operational safety, assuring no release of tritium to the atmosphere, and to the successful simulation of the fusion reaction progress. Through proper training we are helping assure that TSTA facility operators perform their assignments in a safe and efficient manner and that the operators maintain high levels of operational proficiency through continuing training, retraining, requalification, and recertification.

31203 **Tritium system design for the mirror reactors FPD-I, FPD-II, and FPD-III.** Finn, P.A. (Chemical Technology Division, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 911-917(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The tritium system design for the Fusion Power Demonstration Reactor (FPD-I, II, and III) is described. The device operates at 25% availability. For FPD-II, an engineering mode using tritium neutral beams is part of the design.

31204 **Measuring nanocurie quantities of tritium bred in metallic lithium and lithium oxide samples.** Bertone, P.C. (Princeton Plasma Physics Laboratory, Princeton, NJ). *Fusion Technology;* 8: No. 1, 918-926(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The LBM program requires that nanocurie quantities of tritium, bred in both lithium oxide pellets and lithium samples, be measured with an uncertainty not exceeding + or - 6%. Two methods of accurately measuring nanocurie quantities of tritium bred in LBM lithium oxide pellets and one method of accurately measuring nanocurie quantities of tritium bred in lithium samples are described. Potential errors associated with these tritium measurement techniques are also discussed.

31205 **Design of vacuum systems for MFTF-B neutral beamlines.** Vetrovec, J. (TRW Inc., Redondo Beach, CA). *Fusion Technology;* 8: No. 1, 1241-1246(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

MFTF-B is the largest fusion mirror device currently under construction. When completed in 1988 the mirror will be fueled and heated by 11 neutral beamlines whose combined power output will be over 40 MW. These beamlines are being designed and built by TRW Systems. Associated with each beamline is a vacuum system whose performance plays a crucial role in the operation of neutral beams. Good vacuum is needed in the injectors and dump tanks to limit the beam loss due to reionization and to avoid excessive gas flow into the plasma chamber. This paper will describe the design of these vacuum systems and explain the considerations and tradeoffs made in the process.

31206 **Active beam dump module design for MFTF-B.** Weeds, J.; Beck, H.; Chiu, J.; Goldner, A.; Vetrovec, J. (TRW, Inc., Redondo Beach, CA). *Fusion Technology;* 8: No. 1, 1247-1252(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

An actively-cooled dump module design is being developed for use in the MFTF-B long pulse neutral beamlines. The modular approach allows for application of the same design in several different areas, such as positive ion dumps, neutral dumps and beamline apertures. The dump modules are required to dissipate up to 1.2 MW of beam power with peak heat fluxes as high as 1500 W/cm^2 for a lifetime of 50,000 cycles. The modules are constructed from two rows of 1.91 cm O.D. x 0.318 cm wall (0.75 x 0.125 in.) oxygen-free copper tubbing, staggered to achieve maximum optical density. The tubes are bent into a "C" shape and connected to large diameter manifolds at each end. Thermal analysis of conduction in the tube wall has been performed to predict inner wall heat flux and tube wall temperature profiles. The results have been used both as an input to critical heat flux assessment as well as an input to NASTRAN stress analysis. The NASTRAN analysis has shown that tube deflections will be within allowable limits and that the design life will be ≃ 100,000 cycles.

31207 **Modified 180° separation magnet for DIII-Big Dee neutral beam injectors.** Hong, R.; Colleraine, A.P.; Fasolo, J.; Kim, J.; Phillips, J. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 1648-1702(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Neutral beam injection systems for heating the plasma of a fusion research device utilize a deflection magnet to separate the unneutralized residual ions from the neutral particles and steer them into an ion dump. Performance of the separation magnet is crucial in that its failure will cause serious damage to beamline components. A technique using wire orbit simulations was successfully applied to test the performance of the modified 180° separation magnet for DIII-Big Dee neutral beam injectors. It simulated the stable ion trajectories, and showed the fringe field effects and the proper range of operating magnet field strength to be determined.

31208 **FPD plasma heating systems.** Freije, S.A. (TRW, Redondo Beach, CA). *Fusion Technology;* 8: No. 1, 1722-1728(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Tandem mirror devices rely on a number of plasma heating systems to create and maintain potential and density profiles which axially confine the central cell and provide MHD stability. The Fusion Power Demonstrator (FPD) tandem mirror study was carried out in three stages, each facility was configured with a slightly different mission and set of constraints. Although the heating system requirements varied in the three stages, the potential peak and thermal barrier ECRH systems and the sloshing ion neutral beam system were common elements of the configurations. The heating systems' requirements, the design approach, and the systems' description are presented.

31209 **TFTR bakeout system.** Goldfurb, S.; Ponton, W. (Princeton Plasma Physics Laboratory, Princeton, NJ). *Fusion Technology;* 8: No. 1, 1265-1268(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A system was designed and installed on the Tokamak Fusion Test Reactor (TFTR) to monitor temperatures and to control electrical heaters for 150°C bakeout. This system, an adjunct to the hot air vacuum vessel heating system, is used for heating vacuum vessel port covers, neutral beam ducts, and diagnostic vacuum enclosures contiguous with the main vacuum vessel. The control scheme is based on an Allen-Bradley 2-30 Programmable Controller (PC) which acquires thermocouple data, calculates temperature differentials and provides proportional control of the heater power supplies. Temperature differentials between the vessel walls heated by hot air and the electrically heated portions are limited by the system to avoid excessive thermal stress as the machine temperature is raised expeditiously to bakeout level. The system prints out operating parameters and operates independent of the main TFTR control computer which is interconnected only for data display and archiving.

31210 **An ICF Tritium production reactor.** Meier, W.R.; Berwald, D.H.; Gordon, J.D.; McCarville, T.J.; Steele, W.G. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1208-1213(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The conceptual design of an ICF tritium production reactor is described. The chamber design uses a beryllium multiplier and a liquid lithium breeder to achieve a tritium breeding ratio of 2.08. The annual net tritium production of this 532 MW /sub t/ plant is 16.9 kg, and the estimated cost of tritium is $8100/g.

31211 **Plasma heating systems module for TMRSC.** Freije, S.A.; Carson, R.S. (TRW, Redondo Beach, CA). *Fusion Technology;* 8: No. 1, 1774-1782(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

During the preconceptual design phases of a reactor study, many configuration alternatives must be evaluated in a short period of time. A Tandem Mirror Reactor Systems Code (TMRSC) has been developed as a tool in such evaluations. Since plasma heating systems can significantly impact the capital cost and the operational characteristics of a reactor, a heating systems module is an important element of the TMRSC. The module's primary purpose is to supply line power requirements, direct capital costs, and auxiliary system information from a set of physics requirements and general design specifications. The description of the module and some results are presented.

31212 **Qualitative comparisons of fusion reactor materials for waste handling and disposal.** Maninger, R.C. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1367-1375(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The activation of five structural materials and seven coolant/breeder/multiplier materials in a common reference neutron environment was calculated with the FORIG activation code. The reference environment was the neutron flux and spectrum at the first wall of the mirror advanced reactor study (MARS) reactor. Qualitative comparison of these activated materials were made with respect to worker protection requirements for gamma radiation in handling the materials and with respect to their classifications for near-surface disposal of radioactive waste.

31213 **How safe is safe enough? The relation of environmental characteristics and economic competitiveness in fusion-reactor design.** Holdren, J.P. (University of California, Berkeley; Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1625-1630(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The need for fusion energy depends strongly on fusion's potential to achieve ambitious safety goals more completely or more economically than fission can. The history and present complexion of public opinion about environment and safety gives little basis for expecting either that these concerns will prove to be a passing fad or that the public will make demands for zero risk that no energy source can meet. Hazard indices based on "worst case" accidents and exposures should be used as design tools to promote combinations of fusion-reactor materials and configurations that bring the worst cases down to levels small compared to the hazards people tolerate from electricity at the point of end use. It may well be possible, by building such safety into fusion from the ground up, to accomplish this goal at costs competitive with other inexhaustible electricity sources. Indeed, the still rising and ultimately indeterminate costs of meeting safety and environmental requirements in nonbreeder fission reactors and coal-burning power plants mean that fusion reactors meeting ambitious safety goals may be able to compete economically with these "interim" electricity sources as well.

31214 **Issues relating to the siting of tritium-fueled fusion experiments.** Reilly, H.J.; Holland, D.F. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 1631-1636(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A preconceptual design study and safety analysis of the Tokamak Fusion Core Experiment (TFCX) was conducted in 1984 for the Department of Energy. This paper summarizes the calculations and comparisons related to TFCX siting and environmental issues such as radiological doses to the public living near the facility. Included are discussions of (a) routine and accidental releases of tritium, (b) routine releases of activated air, (c) direct radiation (including "skyshine"), and (d) seismic criteria. Other potential issues are also discussed including the amount of tritium that might be retained in the graphite armor in the torus, the possible severity of magnet accidents, and the extent of damage due to plasma disruptions. The conclusions drawn from these calculations should be applicable to some of the other planned ignited core experiments that have operating parameters similar to those of TFCX.

31215 **Fusion facility siting considerations.** Bussell, G.T. (Fusion Engineering Design Center/Stone & Webster Engineering Corporation, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1637-1642(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Inherent in the fusion program's transition from hydrogen devices to commercial power machines is a general increase in the size and scope of succeeding projects. This growth will lead to increased emphasis on safety, environmental impact, and the external effects of fusion in general, and of each new device in particular. A critically important consideration in this regard is site selection. The purpose of this paper is to examine major siting issues that may affect the economics, safety, and environmental impact of fusion.

31216 **High efficiency heat transport and power conversion system for cascade.** Maya, I.; Bourque, R.F.; Creedon, R.L.; Schultz, K.R. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 1832-1837(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Cascade ICF reactor features a flowing blanket of solid BeO and $LiAlO_2$ granules with very high temperature capability (up to about 2300 K). We present here the design of a high temperature granule transport and heat exchange system, and two options for high efficiency power conversion. The centrifugal-throw transport system uses the peripheral speed imparted to the granules by the rotating chamber to effect granule transport and requires no additional equipment. The heat exchanger design is a vacuum heat transfer concept utilizing gravity-induced flow of the granules over ceramic heat exchange surfaces. A reference Brayton power cycle is presented which achieves 55% net efficiency with 1300 K peak helium temperature. A modified Field steam cycle (a hybrid Rankine/Brayton cycle) is presented as an alternate which achieves 56% net efficiency.

31217 **Progress in inertial fusion at LLNL.** Storm, E. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 189-200(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Experiments at LLNL using the 10 TW Novette laser have led to significantly increased understanding of laser/plasma coupling. Tests using 1.06 um, 0.53 um and 0.26 um light have shown increased light absorption, increased efficiency of conversion to x-rays, and decreased production of suprathermal electrons as the wavelength of the incident light decreases. The data indicate that stimulated Raman scattering is the source of the excessive hot electrons and that the effect can be controlled by the proper selection of laser frequency and target material. The control of these effects has led to achievement of higher inertial fusion target compressions and to production of the first laboratory x-ray laser.

31218 **Status of PBFA II for Inertial Confinement Fusion with light ions.** Van Devender, J.P. (Sandia National Laboratories, Pulsed Power Sciences 1200, Albuquerque, NM). *Fusion Technology;* 8: No. 1, 433-440(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The Particle Beam Fusion Accelerator II (PBFA II) is being constructed at Sandia National Laboratories (SNL) with initial operation scheduled for January 1986. PBFA II is the only facility currently under construction that has the possibility of achieving ignition or breakeven in the laboratory. It will deliver 1 to 2 MJ of lithium ions for experiments covering a wide range of Inertial Confinement Fusion (ICF) target designs. PBFA II will be used for studying weapons physics and implosion hydrodynamics in the near-term. In the early 1990s, we anticipate that PBFA II could be modified to produce a pulse-shaping option for exploring high-gain target physics. The achievement of high-gain may require a different accelerator. The potential advantages of pulsed power driven light ions for an energy application include very low cost, small size, small capital investment for an initial power plant, and greater than 20% efficiency for economical power production.

31219 **Collisonal pumping for the production of intense spin-polarized neutral BEAMS: target considerations.** Stearns, J.W.; Burrell, C.F.; Kaplan, S.N.; Pyle, R.V.; Ruby, L.; Schlachter, A.S. (Lawrence Berkeley Laboratory, University of California, Berkeley, CA). *Fusion Technology;* 8: No. 1, 645-650(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Neutral-beam heating and/or fueling offers the possibility of establishing deuteron and triton spins oriented parallel to the magnetic field (or antiparallel to the field). It is believed that the polarizations can be maintained by guide fields until the particles are within the reactor. A beam suitable for this magnetic fusion-energy application would require five to six orders of magnitude increase in polarized beam intensity from the limits imposed by present technology, which is on the order of 10-100 μA. We have recently proposed that ampere-sized beams of nuclear-spin-polarized ions and atoms can be produced by multiple atomic collisions in an electron-spin-polarized medium. By analogy to optical pumping, we have called the process "collisional pumping." Such pumping will occur when an ion beam passes through a thick electron-spinpolarized target in a low magnetic field. As an ion in the beam undergoes a succession of electron-capture and -loss collisions, polarization is transferred from the electron to the nucleus through the hyperfine interaction. After a sufficient number of charge-changing collisions, both the electron and nuclear polarization of the beam will be pumped to the electron polarization of the target. We have analyzed and theoretically demonstrated several examples of collisional pumping; the case that lends itself to earliest testing is that of a low-energy (0.1 - 10 keV/u) hydrogen or deuterium beam passing through a thick electron-spin-polarized alkalivapor target in a low magnetic field.

31220 **Bremsstrahlung shielding analysis of the particle beam fusion accelerator PBFA II.** Sweeney, M.A.; Olsen, J.N. (Sandia National Laboratories, Pulsed Power Theory Division 1265, Albuquerque, NM). *Fusion Technology;* 8: No. 1, 1032-1036(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Shielding of specific electronic components from the harsh bremsstrahlung environment expected on PBFA II has been investigated. 3-D Monte Carlo estimates of dose in locations throughout the facility have been compared with electronic technology thresholds to identify possible problem locations or technologies. In some parts of the facility, implementation of the 30-MV lithium ion diode option will increase dose rates to electronic equipment above tolerable levels. As a result, additional close-in shielding is being employed and some components are being moved to lower radiation level locations. None of the changes are prohibitive in terms of time, cost, or accelerator utility.

31221 **Polonium aspects associated with the use of lead-lithium blankets in fusion applications.** Hoffman, N.J.; Blink, J.A.; Meier, W.R.; Murray, K.A.; Vogelsang, W.F. (ETEC, Canoga Park, CA). *Fusion Technology;* 8: No. 1, 1376-1384(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Polonium, an alpha-emitting sulfur-like element, is formed by neutron irradiation of lead or bismuth impurity in lead. Design studies of both the Pulse*Star inertial confinement fusion (ICF) reactor and the MARS mirror fusion reactor postulated use of 83Pb-17Li melt as the tritium breeding blanket and coolant. Comparison of the amounts of polonium in the melt at plant shutdown indicated that Pulse*Star would have a far higher level of polonium in the melt. Neutronic considerations and the polonium distribution between the vacuum cleanup system and 83Pb-17Li melt for the two reactors are explored in this paper. Sample neutronics runs showed that the codes used by each design team were not the source of the difference in polonium content.

31222 **A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor.** Murray, K.A.; Corugedo, J.J.; Hoffman, N.J. (Energy Technology Engineering Center, Canoga Park, CA). *Fusion Technology;* 8: No. 1, 1901-1908(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Two different primary coolants, Li and 83Pb-17Li, have been examined for use in Pulse Star, a pooltype inertial confinement fusion reactor, and a balance-of-plant design has been generated for each coolant. The use of 83Pb-17Li eliminates concern about the large amount of stored chemical energy found in pure Li fusion reactors. A secondary loop was not included in the 83Pb-17Li coolant design because of the relative nonreactivity of lead-lithium. The design utilizing Li as a primary coolant includes a sodium secondary loop to prevent direct contact between irradiated Li and high-pressure water in the case of a steam generator leak. The secondary loop requires additional piping, pumps, heat exchanger area, and steam generator buildings. These additional costs are mitigated by the low pumping power requirement of Li compared with that of high-density 83Pb-17Li. A cost analysis revealed that the additional costs of the Li coolant design are only slightly greater ($13.5 million) than the cost savings due to the lower pumping power. Preliminary studies indicate that tritium containment will be more costly for the 83Pb-17Li coolant design than for the one involving pure Li because the insolubility of tritium in 83Pb-17Li creates large driving forces for tritium leakage into the surrounding plant. The tradeoff between the two safety concerns of chemical stability in the case of 83Pb-17Li and practicable tritium containment in the case of pure Li needs to be investigated.

31223 **The Pulse Star inertial confinement fusion reactor.** Blink, J.A.; Hogan, W.J. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). *Fusion Technology;* 8: No. 1, 1204-1207(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Pulse Star is a pool-type ICF reactor that emphasizes low cost and high safety levels. The reactor consists of a vacuum chamber (belljar) submerged in a compact liquid metal ($Li_{17}Pb_{83}$ or lithium) pool which also contains the heat exchangers and liquid metal pumps. The shielding efficiency of the liquid metal pool is high enough to allow hands-on maintenance of (removed) pumps and heat exchangers. Liquid metal is allowed to spray through the 5.5 m radius belljar at a controlled rate, but is prohibited from the target region by a 4 m radius mesh first wall. The wetted first wall absorbs the fusion x-rays and debris while the spray region absorbs the fusion neutrons. The mesh allows vaporized liquid metal to blow through to the spray region where it can quickly cool and condense. Preliminary calculations show that a 2 m thick first wall could handle the mechanical (support, buckling, and x-ray induced hoop) loads. Wetting and gas flow issues are in an initial investigation stage.

31224 **Compact inertial confinement fusion multireactor concepts.** Pendergrass, J.H. (University of California, Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1214-1219(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Inertial confinement fusion (ICF) commercial-applications plant-optimum driver pulse repetition rates may exceed reactor pulse-repetition-rate capabilities. Thus, more than one reactor may be required for low-cost production of electric power, process heat, fissionable fuels, etc., in ICF plants. Substantial savings in expensive reactor containment cells and blankets can be realized by placing more than one reactor in a cell and by surrounding more than one cavity with a single blanket system. There are also some potential disadvantages associated with close coupling in compact multicavity blankets and multireactor cells. Tradeoffs associated with several scenarios have been studied.

31225 **A high efficiency I.C.F. driver employing magnetically confined plasma rings.** Meeker, D.J.; Hammer, J.M.; Hartman, C.W. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1191-1197(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

We discuss the possibility of achieving energy, power and power density necessary for ICF by magnetically accelerating plasma confined by a compact torus (CT) field configuration. The CT, which consists of a dipole (poloidal) field and imbedded toroidal field formed by force-free, plasma current, is compressed and accelerated between coaxial electrodes by $B\theta$ fields as in a coaxial railgun. Compression and accleration over several meters by a 9.4 MJ capacitor bank is predicted to give a 5.7 cm radius, 0.001 gm CT 5 MJ kinetic energy (10^7 m/sec). Transport and focusing several meters by a disposable lithium pipe across the containment vessel is predicted to bring 4.8 MJ into the pellet region in 0.5 cm^2 area in 0.3 ns. The high efficiency (about 50%) and high energy delivery of the CT accelerator could lead to low cost, few hundred MW power plants that are economically viable.

31226 **Development of the cascade inertial-confinement-fusion reactor.** Pitts, J.H. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1198-1203(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Caqscade, originally conceived as a football-shaped, steel-walled reactor containing a Li_2O granule blanket, is now envisaged as a double-cone-shaped reactor containing a two-layered (three-zone) flowing blanket of BeO and $LiAlO_2$ granules. Average blanket exit temperature is 1670 K and gross plant efficiency (net thermal conversion efficiency) using a Brayton cycle is 55%. The reactor has a low-activation SiC-tiled wall. It rotates at 50 rpm, and the granules are transported to the top of the heat exchanger using their peripheral speed; no conveyors or lifts are required. The granules return to the reactor by gravity. After considerable analysis and experimentation, we continue to regard Cascade as a promising reactor concept with the advantages of safety, efficiency, and low activation.

31227 **KrF laser cost/performance model for ICF commercial applications.** Harris, D.B.; Pendergrass, J.H. (University of California, Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1220-1228(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Simple expressions for the cost and efficiency of repetitively-pulsed angularly multiplexed KrF laser fusion drivers have been developed for commercial-applications studies. These simple expressions summarize estimates obtained from detailed cost/performance studies incorporating recent results of ongoing physics, design, and cost studies. Contributions of KrF laser capital charges and O & M costs to total levelized constant-dollar (1984) unit ICF power generation cost are estimated as a function of plant size and driver pulse energy using a published gain for short-wavelength lasers and representative values of plant parameters.

31228 **Inertial fusion reactors and magnetic fields.** Cronwell, J.B.; Pendergrass, J.H. (University of California, Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1861-1867(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The application of magnetic fields of simple configurations and modest strengths to direct target debris ions out of cavities can alleviate recognized shortcomings of several classes of inertial confinement fusion (ICF) reactors. Complex fringes of the strong magnetic fields of heavy-ion fusion (HIF) focusing magnets may intrude into reactor cavities and significantly affect the trajectories of target debris ions. The results of an assessment of potential benefits from the use of magnetic fields in ICF reactors and of potential problems with focusing-magnet fields in HIF reactors conducted to set priorities for continuing studies are reported. Computational tools are described and some preliminary results are presented.

31229 **Megajoule-class single-pulse KrF laser test facility as a logical step toward inertial fusion commercialization.** Harris, D.B.; Pendergrass, J.M. (University of California, Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1868-1871(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The cost and efficiency of megajoule-class KrF laser single pulse test facilities have been examined. A baseline design is described which illuminates targets with 5 MJ with shaped 10-ns pulses. The system uses 24 main amplifiers and operates with an optics operating fluence of 4.0 J/cm^2. This system has 9.0% efficiency and costs $200/joule. Tradeoff studies indicate that large amplifier modules and high fluences lead to the lowest laser system costs, but that only a 20% cost savings can be realized by going to amplifier modules larger than 200 kJ and/or fluences greater than 4 J/cm^2. The role of the megajoule-class single-pulse test facility towards inertial fusion commercialization will also be discussed.

31230 **Design optimization of single-main-amplifier KrF laser-fusion systems.** Harris, D.B.; Pendergrass, J.H. (University of California, Los Alamos National Laboratory, Los Alamos, NM). *Fusion Technology;* 8: No. 1, 1872-1877(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

KrF lasers appear to be a very promising laser fusion driver for commercial applications. The Large Amplifier Module for the Aurora Laser System at Los Alamos is the largest KrF laser in the world and is currently operating at 5 kJ with 10-15 kJ eventually expected. The next generation system is anticipated to be a single-main-amplifier system that generates approximately 100 kJ. This paper examines the cost and efficiency tradeoffs for a complete single-main-amplifier KrF laser fusion experimental facility. It has been found that a 7% efficient $310/joule complete laser-fusion

system is possible by using large amplifier modules and high optical fluences.

31231 ICF reactor economics: identifying the high leverage design features. Meier, W.R.; Hogan, W.J. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1820-1825(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Parametric studies were carried out for a heavy ion beam (HIB) fusion electric power plant to investigate the effects on the cost of electricity (COE) of variations in several design parameters. In particular, we examined the effects of maximum achievable chamber pulse rate, driver cost, target gain, electric conversion efficiency, and net electric power. We find that with a combination of improvements over our base case, HIB fusion can be economically competitive with other future power sources.

31232 Hot cell facility design for large fusion devices. Barrett, R.J.; Bussell, G.T. (Fusion Engineering Design Center/Burns & Roe, Inc., Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 318-326(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Large hot cell facilities will be necessary to support the operation of large fusion devices. The supporting hot cells will be needed to serve a variety of different functions and tasks, which include reactor component maintenance, tool and maintenance equipment repair, and preparation of radioactive material for shipment and disposal. This paper discusses hot cell facility functions, requirements, and design issues and techniques. Suggested solutions and examples are given.

31233 Erosion tests of materials by energetic particle beams. Schechter, D.E.; Becraft, W.R.; Hoffman, D.J.; Sluss, F.; Tsai, C.C. (Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 559-564(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The internal components of magnetic fusion devices must withstand erosion from and high heat flux of energetic plasma particles. The selection of materials for the construction of these components is important to minimize contamination of the plasma. In order to study various materials' comparative resistance to erosion by energetic particles and their ability to withstand high heat flux, water-cooled copper swirl tubes coated or armored with various materials were subjected to bombardment by hydrogen and helium particle beams. Materials tested were graphite, titanium carbide (TiC), chromium, nickel, copper, silver, gold, and aluminum. Details of the experimental arrangement and methods of application or attachment of the materials to the copper swirl tubes are presented. Results including survivability and mass losses are discussed.

31234 Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid. Edwards, G.R.; Eberhard, B.A.; Matlock, D.K. (Department of Metallurgical Engineering, Colorado School of Mines, Golden, CO). *Fusion Technology;* 8: No. 1, 937-946(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The embrittlement of 2 1/4Cr-1Mo steel by lithium or lead-lithium liquids can occur when loading conditions and microstructural strengthening effects limit plastic relaxation at points of high stress, and a critical liquid metal induced embrittlement (LMIE) stress is reached. This paper presents the LMIE results of both constant displacement rate uniaxial tensile testing and fatigue crack propagation studies. The temperature for the onset of LMIE susceptibility at a given localized strain rate is shown to be predictable based on a critical value of flow stress, calculated by means of the ZenerHolloman parameter.

31235 Neutral pumping rates for a next step tokamak ignition device. Galambos, J.D.; Heifetz, D.; Peng, Y.-K.M. (FEDC/Oak Ridge National Laboratory, Oak Ridge, TN). *Fusion Technology;* 8: No. 1, 1253-1258(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Neutral pumping rates are calculated for pumplimiter and divertor options of a next step tokamak ignition device using a method that accounts for the coupled effects of neutral transport and plasma transport. For both pump limiters and divertors the plasma flow into the channel surrounding the neutralizer plate is greatly reduced by the neutral recycling. The fraction of this flow that is pumped can be large (>50%) but in general is dependent on the particular geometry and plasma conditions. It is estimated that pumping speeds $\geq 10^6$ L/s are adequate for the exhaust requirements in the pump-limiter and the divertor cases.

31236 Self-sustaining coatings for fusion applications-copper lithium alloys. Krauss, A.R.; Brooks, J.N.; DeWald, A.B.; Gruen, D.M.; Mattas, R.F.; Mendelsohn, M.H. (Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1269-1274(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Dilute binary alloys have been discussed previously as a means of producing self-sustaining coatings for fusion applications. The anticipated advantages of such coatings are described in a companion paper.[11] Issues addressed in this paper concern experimental observation of the formation of a low-Z coating by solute segregation in a Cu-Li alloy, maintenance of the coating in a sputtering environment, and a comparison of the calculated net erosion for W, Mo, and Cu-Li when used as either the divertor plate or the bottom limiter for INTOR.

31237 A new concept for pumping the edge plasma. Barr, W.L. (Lawrence Livermore National Laboratory, Livermore, CA). *Fusion Technology;* 8: No. 1, 1772-1773(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A new concept is proposed for pumped limiter designs that allows more flexibility and therefore better control of the edge plasma and its recycling at the limiter than previous designs.

31238 Thermomechanical testing of beryllium for limiters in ISX-B and jet. Smith, M.F.; McDonald, J.M.; Watson, R.D.; Whitley, J.B. (Sandia National Laboratories, Albuquerque, NM). *Fusion Technology;* 8: No. 1, 1174-1183(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Materials testing of S-65-B grade beryllium has been conducted in order to evaluate the use of this material for limiter surfaces in the ISX-B and JET tokamaks. Selected thermal and mechanical properties were measured at temperatures up to 700 °C. These measurements revealed that S-65-B has exceptionally high ductility (up to roughly 50% elongation) at temperatures expected in normal operation of a beryllium limiter. Thermal fatigue tests under conditions relevant to limiters in ISX-B and JET were also performed using the Sandia National Laboratories Electron Beam Test System (EBTS). Results from these tests were compared to calculated results based on elastic-plastic finite element stress analyses. It was concluded from these tests and analyses that properly designed beryllium limiters should survive normal operation in ISX-B, JET, and similar devices without serious structural failure. Some degree of surface cracking can be expected, however, unless cyclic plastic deformation at the heated surfaces can be adequately controlled by careful design of the limiter.

31239 Safety considerations of lithium lead alloy as a fusion reactor breeding material. Jeppson, D.W.; Muhlestein, L.D. (Westinghouse Hanford Company, Hanford Engineering Development Laboratory, Richland, WA). *Fusion Technology;* 8: No. 1, 1385-1391(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Test results and conclusions are presented for lithium lead alloy interactions with various gas atmospheres, concrete and potential reactor coolants. The reactions are characterized to evaluate the potential of volatilizing and transporting radioactive species associated with the liquid breeder under postulated fusion reactor accident conditions. The safety concerns identified for lithium lead alloy reactions with the above materials are compared to those previously identified for a reference fusion breeder material, liquid lithium. Conclusions made from this comparison are also included.

31240 **Elemental volatility of HT-9 fusion reactor alloy.** Hensiee, S.P.; Neilson, R.M. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 1392-1395(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The volatility of elemental constituents from HT-9, a ferritic steel, proposed for fusion reactor structures, was investigated. Tests were conducted in flowing air at temperatures from 800 to 1200°C for durations of 1 to 20 h. Elemental volatility was calculated in terms of the weight fraction of the element volatilized from the initial alloy; molybdenum, manganese, and nickel were the primary constituents volatilized. Comparisons with elemental volatilities observed for another candidate fusion reactor material, Primary Candidate Alloy (PCA), an austenitic stainless steel, indicate significant differences between the volatilities of these steels that may impact fusion reactor safety analysis and alloy selection. Scanning electron microscopy and energy dispersive spectrometry were used to investigate the oxide layers formed on HT-9 and to measure elemental contents within these layers.

31241 **Low activation burning core reactor design studies.** Cheng, E.T.; Creedon, R.L.; Hopkins, G.R.; Trester, P.; Wong, C.P.C. (GA Technologies Inc., San Diego, CA). *Fusion Technology;* 8: No. 1, 1408-1414(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A preliminary conceptual design study for a very low activation fusion plasma core experimental facility is presented. Low activation is achieved by using only very low activation materials in the inner shield (graphite blocks), vacuum vessel (Al/SiC composite alloy), outer shield (SiC/B_4C) and magnets (Aluminum). The mechanical configuration of the vacuum vessel is a water-flooded double-shell. It is capable of carrying 1.5 MN in hoop compression with a reserve factor of two over the equatorial 0.8 m zone during plasma disruption. Hands-on access to the vacuum vessel and auxiliary equipment provide a high degree of operability, maintainability and flexibility in experimental program. Problem areas are in further development of the aluminum alloy and composite materials for the vacuum vessel and in cost reduction of high purity low activation materials.

31242 **The effectiveness of building wall boration in controlling the neutron responses in a fusion facility.** Ku, L.P.; Kolibal, J.; Liew, S.L. (Princeton University, Plasma Physics Laboratory, Princeton, NJ). *Fusion Technology;* 8: No. 1, 1449-1453(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The relative effectiveness of reducing neutron induced responses in a building by borating the concrete wall was examined. Discussions are presented for the three major variables affecting the boration effectiveness - boron concentration, boration thickness and the area of coverage. Only the generalized neutron sources and room scattering conditions have been used. The data and formula derived from this analysis are useful in the study of design variations.

31243 **Operating and geometrical arrangement requirements for fusion neutronics testing.** Oyama, Y.; Abdou, M.A.; Youssef, M.Z. (University of California at Los Angeles, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 1484-1490(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Neutronics tests in a fusion engineering test device will be required to verify the neutronics prediction capabilities (calculational methods and data base). This paper presents the requirements related to the neutronics test. These requirements include those associated with the operational environment (e.g., wall load, fluence, plasma burn time, etc.) and the ones related to the test module configuration (geometrical arrangements, minimum size for meaningful test information, boundary conditions, etc.). Both experimental consideration and neutronic analyses were carried out to quantify these conditions.

31244 **Neutronics activities for next generation devices.** Gonar, Y. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1542-1551(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Neutronics activities for the next generation devices are the subject of this paper. The main activities include TFCX and FPD blanket/shield studies, neutronics aspects of ETR/INTOR critical issues, and neutronics computational modules for the tokamak system code and tandem mirror reactor system code. Trade-off analyses, optimization studies, design problem investigations and computational models development for reactor parametric studies carried out for these activities are summarized.

31245 **Identification and characterization of the key issues of fusion nuclear technology.** Tilack, M.; Abdou, M.; Berwald, D.; Davis, J.; Deis, G.; Gierszewski, P.; Hollenberg, G.; Kleefeldt, K.; Liu, Y.; Morgan, D.; Piet, S. (University of California Los Angeles, Los Angeles, CA). *Fusion Technology;* 8: No. 1, 1091-1100(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Fusion nuclear technology testing issues are reviewed, covering the technical disciplines of materials science, structural mechanics, MHD, thermal hydraulics, tritium recovery, and others. These issues represent the largest uncertainties whose resolution will require new knowledge through experiments, models, and theory in order to demonstrate the feasibility and attractiveness of the entire fusion nuclear system. Needed tests range in complexity, including basic materials property data, exploration of individual and interactive phenomena, and fully integrated tests. By addressing the complete array of testing issues, this work helps to define needed engineering research which should prove useful in future fusion program planning.

31246 **Interactive effects and fluence goals.** Straalsund, J.L.; Grover, J.M.; Hollenburg, G.W.; Opperman, E.K.; Pugih, R.J. (Westinghouse Hanford Co., Richland, WA). *Fusion Technology;* 8: No. 1, 1109-1114(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Directly related to the key technological issues identified within FINESSE are basic material interactions. These material interactions arise from material property changes and lead to interactive effects which have been identified for several first wall/blanket concepts. Emphasis has been placed upon those interactive effects which are directly related to accumulated neutron damage. For testing purposes the minimum accumulated neutron fluence needed to substantially reduce the uncertainty associated with an anticipated material interaction must be defined. A method of projecting uncertainties associated with interactive effects has been developed to determine these fluence goals for selected issues.

31247 **Utilization of fission reactors for fusion engineering testing.** Deis, G.A.; Miller, L.G.; Yuussef, M. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 1115-1123(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Fission reactors can be used to conduct some of the fusion nuclear engineering tests identified in the FINESSE study. To further define the advantages and disadvantages of fission testing, the technical and programmatic constraints on this type of testing are discussed here. This paper presents and discusses eight key issues affecting fission utilization. Quantitative comparisons with projected fusion operation are made to determine the technical assets and limitations of fission testing. Capabilities of existing fission reactors are summarized and compared with technical needs. Conclusions are then presented on the areas where fission testing can be most useful.

31248 **Radiation damage experiments and lifetime estimates for beryllium components in fusion systems.** Miller, L.G.; Beeston, J.M. (EG & G Idaho, Inc., Idaho Falls, ID). *Fusion Technology;* 8: No. 1, 1152-1156(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The critical need for beryllium as a neutron multiplier in fusion blankets provides a driving force to determine beryllium's mechanical performance at high neutron fluences and temperatures. Extrapolation of mechanical performance and lifetimes for beryllium multipliers have been made based on limited high temperature data obtained from EBR-II irradiated beryllium.

31249 **An assessment of radiation effects in beryllium.** Wolfer, W.G.; McCarville, T.J. (Department of Nuclear Engineering, University of Wisconsin, Madison, WI). *Fusion Technology;* 8: No. 1, 1157-1164(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Radiation effects in beryllium as produced by fast neutrons and resulting in dimensional changes are reviewed. It is found that helium bubble swelling is the predominant mechanism; however, because of the intrinsic anisotropy of the dislocation structure, bubble swelling is expected to be anisotropic, accompanied by radiation-induced growth. The anisotropy of swelling and plastic deformation at the microscopic level of crystal grains eventually results in microcracking, and the total inelastic deformation should therefore not exceed about 1%.

31250 **Calculating the pumping speed of cryopanels: option to Monte Carlo methods.** Vetrovec, J. (TRW Inc., Redondo Beach, CA). *Fusion Technology;* 8: No. 1, 1235-1240(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

The key parameter in calculating the pumping speed of cryopanels is the capture probability. This probability is usually determined by Monte Carlo methods simulating molecular transport of gas. While such methods can be very accurate, they are also rather costly and inflexible. An alternate approach is proposed which uses an analytical method that draws on analogy between radiative heat transfer and molecular gas flow. This analytical method will be described, and it will be shown how it was used to obtain first estimates of pumping speed for the cryopanels for the MFTF-B Neutral Beamlines. The directional dependence of pumping speed is discussed in detail. The results of the calculations are compared to both the Monte Carlo results and experimental data.

31251 **Engineering design of the ALT-II pump limiter for TEXTOR.** Brown, G.W.; Koski, J.A.; Watson, R.D. (Sandia National Laboratories, Albuquerque, NM). *Fusion Technology;* 8: No. 1, 1729-1734(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Advanced Limiter Test II (ALT-II) is an axisymmetric toroidal belt pump limiter scheduled for installation on the TEXTOR tokamak in 1986. ALT-II consists of eight blade segments mounted on adjustable supports located 45° down from the outboard midplane of the torus. The passively cooled pump limiter is designed to remove 5-10% of the plasma efflux and can withstand heat loads on its leading edges up to 300 W/cm^2 for 3 second pulse durations. Engineering analyses for ALT-II include calculations of Lorentz forces that could arise during disruptions and predictions of thermal stresses in the blades. The blades are designed to withstand these conditions without compromising pumping efficiency. Support and drive mechanisms are being designed to operate reliably in TEXTOR with minimum introduction of impurities.

31252 **Surface effects on sputtered atoms and their angular and energy dependence.** Hasanein, A.M. (Fusion Power Program, Argonne National Laboratory, Argonne, IL). *Fusion Technology;* 8: No. 1, 1735-1741(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A comprehensive three-dimensional Monte Carlo computer code, Ion Transport in Materials and Compounds (ITMC), has been developed to study in detail the surface related phenomena that affect the amount of sputtered atoms and back-scattered ions and their angular and energy dependence. A number of important factors that can significantly affect the sputtering behavior of a surface can be studied in detail, such as having different surface properties and composition than the bulk and synergistic effects due to surface segregation of alloys. These factors can be important in determining the lifetime of fusion reactor first walls and limiters. The ITMC Code is based on Monte Carlo methods to track down the path and the damage produced by charged particles as they slow down in solid metal surfaces or compounds. The major advantages of the ITMC code are its flexibility and ability to use and compare all existing models for energy losses, all known interatomic potentials, and to use different materials and compounds with different surface and bulk composition to allow for dynamic surface composition changes. There is good agreement between the code and available experimental results without using adjusting parameters for the energy losses mechanisms. The ITMC Code is highly optimized, very fast to run and easy to use.

31253 **Effects of pulsed operation on the lifetime of turbine rotors.** Nakagawa, Y.; Meyer, J.E. (Nuclear Engineering Department and Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, MA). *Fusion Technology;* 8: No. 1, 1783-1788(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

A pulsed fusion reactor potentially influences many commercial plant design provisions. Provisions related to turbine fatigue performance are among those considered important. They are evaluated by varying several design/operating parameters, separately and in combination, to present tradeoffs among them. These parameters include pulse length and capacity of the thermal storage system. A very simple and fast running temperature/stress representation of the turbine is used for evaluations. Results for wet-steam turbines indicate that requirements for thermal storage are quite large (steam flow between 40 and 80% of full steam flow). Modeling assumptions, design options, and important operating considerations are highlighted.

31254 **Cryopumping hydrogen isotope mixtures in MFTF-B with and without argon adsorbent.** Schumacher, B.J.; Call, W.R. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). *Fusion Technology;* 8: No. 1, 1284-1290(Jul 1985). (CONF-850310—).

From 6. topical meeting on the technology of fusion energy; San Francisco, CA, USA (3 Mar 1985).

Mixtures of hydrogen isotopes, primarily deuterium (D_2), protium-deuterium (HD), and protium (H_2) must be pumped by the vacuum system in the Mirror Fusion Test Facility at Lawrence Livermore National Laboratory. In this study, we used argon as an adsorbent for cryopumping these isotopes at 4.2 K and found that deuterium will displace already adsorbed protium. Thus, when we pump mixtures of the two, sufficient argon must be supplied to adsorb both species. We also found that without argon, deuterium will cryotrap protium in accord with Raoult's law.

31255 **Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiAlO_2$ solid breeders with and without irradiation effects.** Liv, Y.Y.; Tam, S.W. (Argonne National Laboratory, Materials Science and Technology Division, Argonne, IL). *Fusion Technology;* 7: No. 3, 399-410(May 1985).

Thermal conductivities (k,K /sub eff/) have been estimated for sintered and sphere-pac Li_2O and γ-$LiAtO_2$ with and without neutron irradiation effects. The estimation is based on (a) data from unirradiated UO_2, Li_2O, and γ-$LiAlO_2$; (b) data from irradiated dielectric insulator materials; and (c) relatively simple physical models. Comparison of model predictions with limited ex- and in-reactor data found reasonable agreement, thus lending credence for their use in design applications. The impact of thermal conductivities on tritium breeding and power generation in fusion solid breeder blankets is briefly highlighted.

31256 **Analysis of doublet proton spectra from laser implosion experiments.** Welch, D.R.; Harris, D.B.; Miley, G.M. (University of Illinois, Fusion Studies Laboratory, Nuclear Engineering Program, Urbana, IL). *Fusion Technology;* 7: No. 3, 334-344(May 1985).

Double-peaked energy spectra of deuteriumdeuterium protons have been observed from laser implosion experiments at the University of Rochester. These spectra have been used to study implosion dynamics. The energy and broadening of the two peaks relate to distinct burn phases, shock coalescence, and compression. Data are obtained by unfolding the spectra. Using a model for changing target /rho/R conditions, the proton energy loss and the broadening of each peak determine the fuel compression and temperature for each burn phase. An ion temperature for the shock phase is determined from thermal broadening. The compression peak's energy broadening and separation from the shock peak is fit to an adiabatic temperature model. Preliminary data suggest that temperatures during both burns are 20% below that predicted by an extensive simulation code. Compressions are also lower than predicted.

31257 **Cold fusion and graser prospects.** McNally, J.R. *Fusion Technology;* 7: No. 3, 331-333(May 1985).

The possibility of resonance reactions at low temperatures and in dense media is a relatively unexplored territory in fact, it may be a vast wasteland. At higher temperatures and/or much higher densities, the possibility of pycnonuclear reactions is quite well established.[5] Liquid deuterium or deuterium-tritium can ignite at room temperature for densities of about 10^8 or 10^4 g/cm^3, respectively. It should be recognized that if such low-temperature reactions can occur without an accompanying negative temperature coefficient, there is a serious possibility of a runaway reaction giving potentially undesirable and unexpected effects involving large-scale energy excursions. Should beryllium be capable of undergoing any such resonance reactions, it could explain some of the toxicology of beryllium poisoning. Free neutrons from cold fusion may offer the potential of breeding energy rich fusile (tritium or ^{3}He) or fissile (^{233}U or ^{239}Pu) fuels.

31258 **Economic potential of inertial fusion.** Nuckolls, J.H. (Lawrence Livermore National Lab., CA). *Journal of Fusion Energy;* 4: No. 2/3, 181-186(1985). Contract W-7405-ENG-48.

Economic studies suggest that inertial fusion energy's ultimate costs may be only half to two-thirds those of advanced minimum cost fission and coal energy systems. This lower cost derives from two potential advantages of fusion energy: negligible fuel costs and high electrical generating efficiency. The combination of high-quality energy and fluid-shielded walls makes more efficient generation of electricity possible. The first step in demonstrating economic feasibility is to demonstrate scientific feasibility, achieve engineering feasibility, and build a commercially attractive demonstration reactor with available funds, then to build relative small and inexpensive early commercial fusion power plants to reduce utility risks and achieve high learning rates. An economic analysis using sensitivity studies supports long-term economic advantages for fusion. 1 figure, 4 tables.

31259 **Summary abstract: control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment.** Turner, W.C.; Nexsen, W.E.; Allen, S.L.; Hooper, E.B.; Hunt, A.L.; Lang, D.D.; Margolies, D.S.; Pickles, W.L.; Simonen, T.C. (Lawrence Livermore National Lab., CA). *Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films;* 2: No. 2, 653-654(Apr-Jun 1984). Contract W-7405-ENG-48.

Rate equations for the plasma species in a thermal barrier end plug establish an upper bound on the neutral pressure (P) external to the plasma. For the Tandem Mirror Experiment-Upgrade (TMX-U), this bound is $P \leqq 0.5 - 1.0 \times 10^{-6}$ Torr. Initially TMX-U did not satisfy this criterion, and axial end plugging of plasma losses seemed limited by the excess pressure. Subsequently, the machine was modified to improve the vacuum conditions, decreasing P to the desired range. At the same time axial end plugging of plasma losses increased to the duration of neutral beam injection and ECRH heating. Experimental measurements of gas input are discussed. Detailed accounts of the specific modifications, the dynamic pressure measurements, a rate equation for end plug pressure, and the increase in axial end plugging are given.

31260 **Eddy current modelling and poloidal field penetration in TFTR.** Brown, D.I.; Bell, M.G.; Coonrod, J. (Princeton University, Princeton, NJ). pp 56 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

Prior to the first operation of TFTR in December 1982, a circuit model was developed to study the time-dependent magnetic fields generated by eddy currents induced in the structure. The sources of excitation of the structure were the poloidal coil systems, namely the ohmic heating (OH), equilibrium field (EF) and variable curvature (VC) windings, and the plasma current itself. To make the problem of treating the whole structure tractable, the eddy current flow patterns were reduced to a set of about 200 defined paths for which all mutual couplings were calculated. The vacuum vessel was modelled by a set of 36 parallel, axisymmetric strips. Saddle currents induced by the presence of the 8 poloidally symmetric bellows sections were not simulated in the model. The results of this strip model were compared with those from a periodic discrete-mesh simulation of the vessel alone which allowed for the presence of saddle currents. For a sinusoidal excitation of the OH system, there was good agreement in the complex field response inside the vessel between the two models. For the toroidal field (TF) coil structure, small scale, periodic current paths have a dominant effect. These were modelled by choosing a set of effective, toroidally symmetric paths with resistances reflecting the actual current patterns. Once again, comparison of the simple model with a discrete-mesh simulation of the TF structure alone showed satisfactory agreement in the frequency range of interest.

31261 **Magnet alignment in MFTF-B.** Thomassen, K.I.; Baldwin, D.E.; Yamaguchi, G.T. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). pp 23 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

In the MFTF-B axicell tandem mirror the magnetic design of the transition region is critical to achieving high performance in the machine. The normal and geodesic field curvatures determine the MHD β-limits in the machine, govern the equilibrium in the center cell by controlling parallel currents that might extend into the center cell, and limit the radial transport time for the device. The last of these determines the plasma "Q". Key to this design is the "double fan" transition as invented by Baldwin and Bulmer. In this double fan, there is no net geodesic curvature as defined by an integral over positive and negative contributions from each individual fan. Despite this cancellation, passing particles still see a net geodesic curvature if they drift azimuthally in transit between these individual peaks. A net difference of a few percent of the contribu-

tion from one peak gives use to the calculated 1 sec radial containment time in MFTF-B.

31262 **Invited paper: measurements and model of the coupled particle loss and fluid acceleration in the boundary layer of the zt-40m reversed-field pinch.** Jacobson, A.; Burkhardt, C.; Rusbridge, G. (Los Alamos National Laboratory, Los Alamos, NM). pp 38 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

Coordinated measurements of density fluctuations, using a 10-chord forward scattering array, and of poloidal voltage fluctuations (for frequencies lower than the liner's skin frequency) have led to a consistent account of fluid acceleration associated with pulsed particle loss. The fluctuations involved in this mechanism are present from the beginning of the discharge, and are not obviously related to termination percursor phenomena observed in ZT-40M and discussed elsewhere. The dominant density fluctuation in ZT-40M is an impulsive (risetime about 5 μs) poloidally symmetric cavitation occurring in an annulus ($\Delta r \simeq 0.02$-0.04 m) near the liner ($r = a = 0.2$ m). The pulsed disturbance is primarily due to radial loss of plasma to the liner rather than to toroidal convection. The peak ion flux to the liner is Γ /sub i/ $\geqq 10^{23}$ m^{-2} s^{-1} during an impulse. The cavitations leave an imprint in the density profile that propagates toroidally (against I /sub PHI/) with a speed about (1-2) x 10^4 m/s. Another important fluctuating quantity, the poloidal voltage at the plasma boundary, is dominated by impulsive spikes whose full-width is similar to the density-cavitations risetime. The spikes propagate toroidally (against I /sub PHI/) with a speed about 3 x 10^4 m/s and survive for a pathlength $\leqq$ 1 m. The voltage spikes and density cavitations are highly correlated.

31263 **Thomson scattering measurements in the FRX-C device.** Rej, D.J.; Armstrong, W.T.; Bartsch, R.R.; Chrien, R.E.; Cochrane, J.C.; Kewish, R.W.; Klingner, P.L.; McKenna, K.F.; Sherwood, E.G.; Siemon, R.E. (Los Alamos National Laboratory, Los Alamos, NM). pp 37-38 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

Electron temperature measurements have been made on the field-reversed configuration (FRC) plasmas generated in the FRX-C experiment at Los Alamos. An 8 joule, 5 mrad divergence, 30 ns pulse length ruby laser is fired end-on and focussed to a point 15 cm from the axial midplane of the 2-m-long O-pinch coil. The radial position of the focus, ranging between r = O and 15 cm, can be changed on a shot-to-shot basis. The detector located perpendicular to the incident beam consists of a f/5, 7 channel, triple grating polychromator. /sup 2,3/ T /sub e/ data were taken at two experimental conditions corresponding to 20 mtorr and 5 mtorr D_2 fill pressures.

31264 **Invited paper: confinement scaling, equilibrium, and stabilization studies in FRX-C.** Siemon, R.E.; Armstrong, W.T.; Bartsch, R.R.; Chrien, R.E.; Cochrane, J.C.; Kewish, R.W.; Klingner, P.L.; Linford, R.K.; McKenna, K.F.; Rej, D.J. (Los Alamos National Laboratory, Los Alamos, NM). pp 37 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

The field-reversed configuration (FRC) is a low aspect ratio, highly prolate compact toroid without toroidal field. ERC's are produced in the Los Alamos FRX-C device, a 50-cm i.d. x 200-cm long field reversed theta pinch. Passive mirrors of 20-cm axial extent and 44-cm i.d. provide an on-axis mirror ratio of 1.17 at each end. Detailed experimental and theoretical studies have been directed toward determining the confinement scaling, and equilibrium and stability properties of the FRC's generated in FRX-C. Measurements have been made over a wide range of plasma parameters (T /sub e/ + T /sub i/ $\simeq$ 200-700 eV, n /sub e/ $\simeq$ 2-5 x 10^{15} cm^{-3}, and $\langle\beta\rangle \simeq 0.9$). The FRC particle confinement time (/tau/ /sub N/) scaling has been obtained using both end-on holographic interferometry, and a combination of side-on quadrature interferometry and axial excluded-flux array. The measured /tau/ /sub N/ 's of up to 190 μs are consistent with R^3//rho/ /sub io/ scaling (where R is the FRC major radius and /rho/ /sub io/ is the ion gyroradius in the external magnetic field) and are in good agreement with theoretical predictions based on lower-hybrid-drift induced particle transport. The energy containment times, estimated from a global equilibrium model, are about /tau/ /sub N/ /2, indicating that energy loss through thermal conduction and/or radiation is comparable to the energy lost through particle transport. The closed-flux containment times are within a factor of 3-7 smaller than calculated using classical resistivity.

31265 **Scaling experiments on plasma opening switches for inductive energy storage applications.** Boller, J.R.; Commisso, R.J.; Cooperstein, G.; Goldstein, S.A.; Neri, J.M.; Ottinger, P.F.; Renk, T.J.; Shipman, J.D.; Stephanakis, S.J.; Weber, B.V. (Naval Research Laboratory, Washington, DC). pp 34 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

A new type of fast opening switch for use with pulsed power accelerators is examined. This Plasma Opening Switch (POS) utilizes an injected carbon plasma to conduct large currents (circa 1 MA) for up to 100 ns while a vacuum inductor (circa 100 nH) is charged. The switch is then capable of opening on a short (circa 10 ns) timescale and depositing the stored energy into a load impedance. Output pulse widths and power levels are determined by the storage inductance and the load impedance. The switch operation is studied in detail both analytically and experimentally. Experiments are performed at the 5 kJ stored energy level on the Gamble I generator and at the 50 kJ level on the Gamble II generator. Results of both experiments are reported and the scaling of switch operation is discussed.

31266 **Cesium transpiration through a negative-ion forming electrode.** Fink, J.H. (Lawrence Livermore National Laboratory, University of California, Livermore, CA). pp 66-67 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

In self-extracting sources of negative ions, conflicting processes simultaneously build and destroy the cesium coverage of the negativeion forming electrode. Optimum negative-ion emission is thought to occur at about 65% of a mono-atomic cesium layer on a molybdenum surface and the coverage attained experimentally is less than optimum. To increase the negative-ion emission an additional source of cesium is needed. This article proposes cesium transpiration through the negative-ion-forming. The negative-ion-forming-electrode is placed in a cesium-hydrogen discharge at a negative bias of 150 volts. Hydrogen is absorbed on the electrode surface along with a cesium buildup, contributed by the neutral component of cesium escaping the discharge plus whatever fraction of cesium ions stick, having been accelerated across the 150 volt sheath.

31267 **Distribution of electric fault currents in MHD faraday generators.** Kuo, S.P.; Levi, E.; Liu, C.C. (Polytechnic Institute of New York, Farmingdale, NY). pp 9 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

The information about the spatial distributions of currents and voltages is important for an understanding of the MHD channel performance in several aspects. The previous analysis by using an equivalent[1] circuit for MHD Faraday Generators shows that the

fault currents may exceed the rated currents by one order of magnitude. If, as could be expected, these large currents were drawn locally and directly from the inner core of the plasma, then its gross flow rate would be affected. If, instead, the bulk of the plasma is shielded from the disturbance and the perturbation is restricted to a thin layer near the boundary surfaces, then the resulting body force and heating affects the fluid dynamics of the boundary layer and the mode of current transfer to the electrodes. In addition, knowledge of the current distribution at the surface of the electrode itself provides guidance for its design and for the design of the interelectrode insulation.

31268 **Comparison of diode voltage and ion energy for an intense pulsed ion-beam diode.** Young, F.C.; Boller, J.R.; Goldstein, A.; Shyke, A.; Stephanakis, S.J. (Naval Research Laboratory, Washington, DC). pp 33-34 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts only.

A comparison is made of the voltage applied to an intense pulsed ion-beam diode and the energy of deuterons emitted from the diode. The authors measured the energy of deuterons from diodes operating at peak voltages ranging from 0.5 to 1.5 MV. The deuteron energy is determined by neutron time-of-flight (TOF) using d-d neutrons. Deuterons from a CD_2-coated anode bombard a thin CD_2 target located at the cathode to produce neutrons which are detected at 0°. Measured voltage and ion current traces are used to calculate the neutron TOF trace. The deuteron energy is determined by adjusting the magnitude of the voltage so that the calculated TOF trace agrees temporarily with the measured trace. Peak deuteron energy is determined to a precision of 5 to 10% for a flight path of 7.7m. The diode voltage is deduced from a capacitive voltmeter with an inductive correction for the difference between the voltmeter and diode locations.

31269 **An experimental study of a quasi-optical gyrotron for fusion applications.** Park, S.Y.; Bergeron, G.L.; Fliflet, A.; Granatstein, V.L.; Kim, K.J.; Read, M.E.; Seeley, R. (Naval Research Laboratory, Washington, DC). pp 39 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

In this paper the authors report results of a proof of principle experiment of a quasi-optical gyrotron. This type of gyrotron differs from "conventional" gyrotrons in that an optical (Fabry-Perot), rather than a microwave, cavity is used. The optical cavity has a substantially lower mode density than that of a conventional microwave cavity. Therefore, a large cavity can be used, resulting in relatively low ohmic losses at the mirrors. In addition, with the cavity axis perpendicular to that of the electron beam, the collection of the beam is uncoupled from the microwave output guide. Finally, the cavity is mechanically tunable. The present experiment is expected to produce approximately 100 KW at 120 GHz, with a pulse length of 1.5 μs. An efficiency of >25% is expected. Experimental results and comparison with theory are discussed.

31270 **Invited paper: high power gyrotrons for fusion applications.** Fliflet, A.W.; Carmel, Y.; Chu, K.R.; Dialetis, D.; Granatstein, V.L.; Read, M.E.; Seeley, R. (Naval Research Laboratory, Washington, DC). pp 38-39 of 1983 IEEE international conference on plasma science. New York, NY; IEEE (1983). (CONF-830590—).

From IEEE international conference on plasma science; San Diego, CA, USA (25 May 1983).

Abstracts Only.

An experimental gyrotron with an output power level > 1 MW in the TE^{o}_{6s} mode at 94 GHz is in preparation at NRL. The experiment will be run in a pulsed mode but should be scalable to CW operation. This paper will discuss the issues impacting the design of this experiment with emphasis on the mode selectivity and efficiency of the microwave circuit, and on the beam formation system. The issue of mode selectivity is critical to the development of high power, high frequency gyrotrons due to the necessity of using highly over-moded waveguide structures in the interaction region. As output power and frequency increase, the range of operating parameters which allow stable operation of conventional gyromonotrons becomes increasingly limited. This effect often severely limits the efficiency in the desired operating mode.

99 GENERAL AND MISCELLANEOUS

31271 **(DOE/ER—0268) Nuclear engineering enrollments and degrees, 1985.** (Oak Ridge Associated Universities, Inc., TN (USA)). Mar 1986. Contract AC05-76OR00033. 65p. NTIS, PC A04/MF A01 - GPO. File Number TI86009876.

The 1985 nuclear engineering survey included 66 academic institutions. Sixty-four institutions reported numbers of enrollments and degrees, although three of these have officially suspended their programs. Undergraduate enrollments in 1985 decreased by 162 students (-9%) from 1984. Masters candidate enrollments also decreased in 1985 with 601 full-time students and 234 part-time students for a total of 835, a decrease of 89 students (-10%) with the number of full-time students accounting for the largest portion of the decrease. The number of doctoral candidates rose by 23 (+4%) over 1984; however, the number of US citizen Ph.D. candidates declined by 11 (-4%). The number of degrees awarded decreased at all levels from 1984 to 1985: bachelor's degrees by 68 (-9%), masters degrees by 10 (-3%), and doctoral degrees by 19 (-14%).

31272 **(PNL—5812) General design of a technical assistance program to help DOE/prime contractor buyers in doing business with small disadvantaged businesses.** Wood, M.T.; Radford, L.R.; Saari, L.M.; Wright, J. (Pacific Northwest Labs., Richland, WA (USA)). Apr 1986. Contract AC06-76RL01830. 38p. (BHARC—400/86/005). NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009938.

This report offers a design and recommendations for implementing a program of education to assist Department of Energy buyers and procurement officers in increasing the quality and quantity of small disadvantaged business (DB) participation in their contracted work. The recommendations are based on a previous companion report, "Issues in Contracting with Small Minority Businesses," from which technical assistance and related needs were derived. The assistance program is based on buyer and disadvantaged-business needs, as determined from synthesizing the results of interviews with over two dozen minority business leaders and procurement officers.

31273 **(UCRL—94518) Training and development and education at Lawrence Livermore National Laboratory.** Holmes, H.C. (Lawrence Livermore National Lab., CA (USA)). Jan 1986. Contract W-7405-ENG-48. 7p. (CONF-860586—2). NTIS, PC A02/MF A01; GPO Dep. File Number DE86010158.

From World conference on continuing education; Lake Buena Vista, FL, USA (7 May 1986).

In addition to the cafeteria of opportunities LLNL provides its employees, there are other factors that create an atmosphere that affirms education as important and encourages an employee to decide on his own career needs. For example, employees are given full information on all on-site activities. Each quarter every employee is mailed complete course descriptions and schedules of LLNL sponsored programs. As another example, almost all courses are taught during normal work hours. Through a combination of Laboratory policy, practices and diversity of options, LLNL management actively commits to the career development of its employees.

31274 **Current Energy Patents: a current awareness journal.** Thoeming, G. (ed.). (Dept. of Energy, Technical Information Center, Oak Ridge, TN). *Current Energy Patents;* **86**: No. 1, vp(Jan 1986). (PB—86-902801; CEP—86/1).

Available from National Technical Information Service, Springfield, VA 22161 on a subscription basis at $85.00 per volume (calendar) year.

This monthly current awareness journal provides abstracting and indexing coverage of the international patent literature, including patent applications, that concerns any aspect of energy produc-

tion, conservation, and utilization. The journal includes all patents entered into the Energy Data Base. The literature is arranged by subject category and inventor, subject, and patent number.

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 30035, 30959

31275 (AEEW-M—2234) Versatile computer based system for data acquisition manipulation and presentation. Bardsley, D.J. (UKAEA Atomic Energy Establishment, Winfrith). Dec 1985. 47p. Atomic Energy Establishment, Winfrith Dorchester, Dorset, England. File Number TI86901295.

A data acquisition system based on a Midrodata M1600L data logger and a Digital Equipment Corporation VT103 computer system with associated storage and display peripherals is described. Discussions of the data acquisition system, the data logger, experimental applications, data processing, hardware processing facilities, software processing facilities, data presentation, hardware plotting facilities, and software plotting facilities are included. Operating instructions for the logger and its application to experimental measurements are included in the appendices. 1 ref., 9 figs., 3 tabs. (DWL)

31276 (ANL/TM—431-Rev.) Electronic mail at ANL. Revision. Finkel, B.; Andre, M.; Janoski, K. (Argonne National Lab., IL (USA)). Mar 1986. Contract W-31-109-ENG-38. 191p. NTIS, PC A09/MF A01; 1; GPO Dep. File Number DE86009663.

Electronic Mail at ANL discusses concepts, issues, and commands basic to electronic mail and describes the capabilities and limitations of the electronic mail systems currently in place at Argonne National Laboratory, with an emphasis on communication through the BITnet network. The primary purpose of this document is to complement the detailed information found in vendor documents on electronic mail. Chapter 1 explains how electronic mail may benefit you and answers many basic questions about this communications system. It defines electronic mail, compares it with conventional mail and telephone communication, lists the benefits electronic mail users enjoy, and familiarizes readers with the Argonne electronic mail universe. Chapter 2 defines three electronic mail concepts: (1) addresses, (2) networks, and (3) gateways. It also explains how to find electronic mail addresses, how to communicate electronically when at home or traveling, and how systems format electronic mail files. Chapter 3 explains how users send electronic mail through the electronic mail systems at Argonne. Structured descriptions of each mail system provide answers to basic questions on how to use each system. Note that the subsection concerning Wylbur electronic mail is the only documentation available on that subject. Chapter 4 describes which networks and network gateways are available to Argonne electronic mail users. This chapter provides such information as what the networks are, how big they are, and where they are located. 1 fig., 5 tabs.

31277 (ANL/TM—438) Guide to sharing personal computer resources via local area networks. Winkler, L. (Argonne National Lab., IL (USA)). Mar 1986. Contract W-31-109-ENG-38. 69p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009665.

This Guide is for professional staff who commonly need computing tools on personal computers, minicomputers, mainframe computers, and supercomputers. It provides information and recommendations about personal computer local area networks in the context of the larger scheme of computing tools and services at the Laboratory. The material presented here is for the person considering installation of a personal computer local area network. Chapter 1 introduces the reader to the concept of personal computer local area networks and provides background material on networking. Chapter 2 summarizes Computing Services' evaluation of personal computer local area networking in general terms. Chapter 3 describes the technical and functional details of Computing Services' Personal Computer Local Area Network Evaluation and Demonstration Project. Chapters 4 and 5 are for individuals who are familiar with personal computing and who will be responsible for establishing a local area network. Chapter 4 covers technical issues relating to the prototype network installation in Building 221. Chapter 5 warns potential users what to expect when establishing a local area network. 7 figs., 9 tabs.

31278 (EUR—9874) Elasto-plastic benchmark calculations. Step 1: verification of the numerical accuracy of the computer programs. Corsi, F. (Commission of the European Communities, Luxembourg). 1985. 53p. NTIS (US Sales Only), PC A04/MF A01. File Number DE86751613.

In connection with the design of nuclear reactors components operating at elevated temperature, design criteria need a level of realism in the prediction of inelastic structural behaviour. This concept leads to the necessity of developing non linear computer programmes, and, as a consequence, to the problems of verification and qualification of these tools. Benchmark calculations allow to carry out these two actions, involving at the same time an increased level of confidence in complex phenomena analysis and in inelastic design calculations. With the financial and programmatic support of the Commission of the European Communities (CEE) a programme of elasto-plastic benchmark calculations relevant to the design of structural components for LMFBR has been undertaken by those Member States which are developing a fast reactor project. Four principal progressive aims were initially pointed out that brought to the decision to subdivide the Benchmark effort in a calculations series of four sequential steps: step 1 to 4. The present document tries to summarize Step 1 of the Benchmark exercise, to derive some conclusions on Step 1 by comparison of the results obtained with the various codes and to point out some concluding comments on the first action. It is to point out that even if the work was designed to test the capabilities of the computer codes, another aim was to increase the skill of the users concerned.

31279 (EUR—10115) EURDYN-1D: a computer code for the one-dimensional non-linear dynamic analysis of structural systems. Description and users' manual (release 1). Casadei, F.; Halleux, J.P. (Commission of the European Communities, Ispra (Italy). Joint Research Centre; Commission of the European Communities, Luxembourg). 1985. 197p. NTIS (US Sales Only), PC A09/MF A01. File Number DE86751612.

The goal of the present report is to provide for a comprehensive users' manual describing the capabilities of the computer code EURDYN-1D. It includes information and examples about the type of problems which can be solved with the code and explanation on how to prepare input data and, how to interpret output results. The field of applications of EURDYN-1D is the one dimensional dynamic analysis of general structural systems and the code is particularly suited for fast transient events involving propagation of longitudinal mechanical waves (subsonic) in structures. Both geometrical and physical non-linearities can be taken into account. Typical examples are impact problems, fast dynamic loading due the explosions or sudden release for initial loads due to failures, etc. To these classes belong many problems encountered in the reactor safety field as well as in more common and general technological applications.

31280 (N—86-16945) Multiprocessor sparse L/U decomposition with controlled fill-in. Final report. Alaghband, G.; Jordan, H.F. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Oct 1985. 39p. NTIS, PC A03/MF A01.

Generation of the maximal compatibles of pivot elements for a class of small sparse matrices is studied. The algorithm involves a binary tree search and has a complexity exponential in the order of the matrix. Different strategies for selection of a set of compatible pivots based on the Markowitz criterion are investigated. The competing issues of parallelism and fill-in generation are studied and results are provided. A technque for obtaining an ordered compatible set directly from the ordered incompatible table is given. This technique generates a set of compatible pivots with the property of generating few fills. A new hueristic algorithm is then proposed that combines the idea of an ordered compatible set with a limited binary tree search to generate several sets of compatible pivots in linear time. Finaily, an elimination set to reduce the matrix is select-

ed. Parameters are suggested to obtain a balance between parallelism and fill-ins. Results of applying the proposed algorithms on several large application matrices are presented and analyzed.

31281 (N—86-17267, pp vp) **Image processor architectures and a data-driven image processore: TIP-1.** Temma, T. 1984. NTIS, PC A14/MF A01. (NAL-SP—3; CONF-8407170—).

From 2. NAL symposium on aircraft computational aerodynamics; Tokyo, Japan (5 Jul 1984).

Many high speed image processors have been developed to date. In this paper, these processors are classified from the view point of parallel implemenon of identical processor elements and pipeline implementation with many types of processor elements. These processors are designed not only for high speed processing capabilities but also for compactness in hardware size. An image processor TIP-1 (Template-controlled Image Processor-1) was proposed and has been developed as progressive architecture for pipeline mechanisms. TIP-1 architecture is presented and an advanced system, TIP-3, using VLS1 chips, is proposed.

31282 (N—86-17997) **Partitioning problems in parallel, pipelined and distributed computing. Final Report.** Bokhari, S. (National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center). Nov 1985. 34p. NTIS, PC A03/MF A01.

The problem of optimally assigning the modules of a parallel program over the processors of a multiple computer system is addressed. A sum-bottleneck path algorithm is developed that permits the efficient solution of many variants of this problem under some constraints on the structure of the partitions. In particular, the following problems are solved optimally for a single-host, multiple satellite system: partitioning multiple chain structured parallel programs, multiple arbitrarily structured serial programs and single tree structured parallel programs. In addition, the problems of partitioning chain structured parallel programs across chain connected systems and across shared memory (or shared bus) systems are also solved under certain constraints. All solutions for parallel programs are equally applicable to pipelined programs. These results extend prior research in this area by explicitly taking concurrency into account and permit the efficient utilization of multiple computer architectures for a wide range of problems of practical interest.

31283 (N—86-17998) **Research in computer science, semi-annual report.** Ortega, J.M. (Virginia Univ., Charlottesville (USA)). Jan 1986. 8p. NTIS, PC A02/MF A01.

Various graduate research activities in the field of computer science are reported. Among the topics discussed are: (1) failure probabilities in multi-version software; (2) Gaussian elimination on parallel computers; (3) three dimensional Poisson solvers on parallel/vector computers; (4) automated task decomposition for multiple robot arms; (5) multi-color incomplete Cholesky conjugate gradient methods on the Cyber 205; and (6) parallel implementation of iterative methods for solving linear equations.

31284 (SAND—85-2389) **Practical paradigm for parallel processing problems.** Davidson, G.S. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1986. Contract AC04-76DP00789. 16p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009274.

Data flow computers achieve high performance by keeping as many processing elements busy as possible for a given algorithm. However, without specialized architectures, the synchronization overhead of data-driven computations can prevent significant speedup. To address this problem, the concept of task flow is developed for more general purpose multiprocessors. Task flow differs from data flow in the amount of computation between synchronizations (at the expense of some parallelism). A software technique is described that implements task flow for general purpose multiprocessors with local and shared memories. A SANDAC-IV multiprocessor example of this technique is given, together with timing results. 8 refs., 10 figs., 1 tab.

31285 (SAND—85-2511) **Verification study of SHELL SHOCK.** Allen, J.J. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1986. Contract AC04-76DP00789. 43p. NTIS, PC A03/MF A01; 1; GPO Dep. File Number DE86009986.

A verification study of the axisymmetric finite element code, SHELL SHOCK is documented. This study investigates the accuracy of the various features of SHELL SHOCK, which are used. The problems presented in this study were chosen for their simplicity and known solutions, or for the ability to model the problem accurately in another finite element code. SHELL SHOCK was shown to be an accurate code; however, the beam element has certain limitations. An alternative connection element was developed which would alleviate the beam element limitations. 5 refs., 25 figs., 4 tabs.

31286 (SAND—86-0249) **Revision of Primary Standards Laboratory's methods to calculate water vapor pressures.** Odom, M.K. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1986. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009985.

Accurate water vapor pressure values are important for humidity calibrations in the Primary Standards Laboratory. Updated and enhanced vapor pressure equations are given. Enhancement takes the presence of air into account. Computer programs that use the updated and enhanced vapor pressure equations are discussed. Included are descriptions of these programs, sample inputs and outputs, structural relationships between main programs, subroutines, and functions, and complete listings of these program elements. 4 refs. 3 tabs. (DWL)

31287 (UCID—20721) **MVUSRS utility reference manual.** Brengle, T.A. (Lawrence Livermore National Lab., CA (USA)). Nov 1985. Contract W-7405-ENG-48. 71p. NTIS, PC A04/MF A01; 1; GPO Dep. File Number DE86009934.

The MVUSRS utility assists in the moving of TOPS-10/20 user accounts to VMS systems. MVUSRS runs on the source TOPS-10/20 system and combines user account information from the TOPS system (from REACT on TOPS-10 or from DLUSER on TOPS-20) with input from the operator of the utility to generate a VMS DCL COM file. This COM file can then be shipped to the target VMS system and executed. MVUSRS is known to work with TOPS-10 Version 4.01, TOPS-20 Version 5.1, and VMS Version 4.1. Other versions may work, but have not been tested. In particular, it is unlikely that MVUSRS will work with versions of VMS prior to 4.0 since much has been made of the enhanced user account information available in Version 4.0. The MVUSRS source listing is provided. (DWL)

31288 (UCRL—94310) **Evolving directions of PC applications in electromagnetics analysis and design.** Miller, E.K.; Deadrick, F.J. (Kansas Univ., Lawrence (USA). Dept. of Electrical and Computer Engineering; Lawrence Livermore National Lab., CA (USA)). 25 Mar 1986. Contract W-7405-ENG-48. 7p. (CONF-8604170—1). NTIS, PC A02/MF A01; 1; GPO Dep. File Number DE86009695.

From Tactical communication conference; Fort Wayne, IN, USA (22 Apr 1986).

This paper serves as both an introduction to electromagnetic analysis and design software for the personal computer, and also as a short introduction to the evolution of computer technology which has made such analysis possible. Progress in microprocessor technology, memory devices, mass storage devices, and software are outlined. The increasing availability and capabilities of modeling software now provides in a micro- or personal computer environment some modeling procedures formerly limited to mini- or mainframe computers. These and other aspects of the present status and anticipated future directions of PC applications in Electromagnetics are discussed in the paper. 2 figs., 2 tabs. (DWL)

31289 (UCRL—94340) ARC-OLOGY via TELL-A-GRAF. Biggers, D. (Lawrence Livermore National Lab., CA (USA)). 10 Mar 1986. Contract W-7405-ENG-48. 16p. (CONF-860363—3). NTIS, PC A02/MF A01; GPO Dep. File Number DE86009698.

From ISSCO week; New Orleans, LA, USA (10 Mar 1986).

This paper addresses the problem of drawing a circle or an arc, or bending text strings around arcs using TELL-A-GRAF software. ARC-OLOGY is a front-end to TELL-A-GRAF and was developed to solve this problem. With this (or a similar) capability the TELL-A-GRAF user will be more able to include circles, arcs and arched text in the design of logos, icons and other graphic representations. This paper describes the process by which the ARC-OLOGY front-end generates the necessary TELL-A-GRAF data. The capability is available via the Flop-Swap for both Nomad2 and dBASE III environments. However, for users desiring this capability in another environment, this description can also be used as basic specifications for an in-house developed front-end. (DWL)

31290 Algorithms + Alchemy = Architectures. Douglass, R.J. (Computer User Services, Los Alamos National Lab., Los Alamos, NM). pp 105-114 of Algorithmically specialized parallel computers. Snyder, L.; Jamieson, L.H.; Gannon, D.B.; Siegel, H.J. Orlando, FL; Academic Press (1985).

Algorithmically specialized architectures are usually designed and built to increase execution speed by taking advantage of parallelism inherent in a particular algorithm. In serial systems, algorithmically specialized machines are created through the alchemy of software whereby a program is mapped onto a general purpose serial computer. This paper provides one answer for the question of why fast general purpose parallel machines are not being transformed into specialized architectures with software. Part of the answer is the difficulty in mapping an algorithm onto a parallel architecture without introducing a new serial component. A solution will follow from a better understanding of the mapping process and by seeking general purpose techniques for optimizing it. A simple image processing task on the massively parallel processor (MPP) is used to illustrate the problem, and a software solution involving program flow analysis is presented.

31291 Two parallel formulations of particle-in-cell models. Buzbee, B.L. (Computing Div., Los Alamos National Lab., Los Alamos, NM). pp 223-232 of Algorithmically specialized parallel computers. Synder, L.; Jamieson, L.H.; Gannon, D.B.; Siegel, H.J. Orlando, FL; Academic Press (1985).

This paper discusses parallel formulation of PIC models for master/slave architectures and ring architectures. Because interprocessor communication can be a decisive factor in the overall efficiency of a parallel system, the authors show how to divide these models into large granules that can be executed in parallel with relatively little need for communication. They also report measurements of speed-up obtained from experiments on the UNIVAC 1100/84 and the Denelcor HEP.

31292 Assessing the significance of a spatial correlogram. Oden, N.L. (Brookhaven National Labs., Upton, NY). *Geographical Analysis;* **16**: No. 1, 2-16(Jan 1984).

Simulations comparing the power of the Q-test to the power of several other techniques under several alternative hypotheses reveal the following. The decision rule involving inspection of only the lag-1 autocorrelation coefficient is insensitive to certain forms of spatial dependence, for example, dependence involving interactions that are strongest at high-order lags. A modified Kooijman's (1976) technique is roughly equal in power to the other methods investigated, but requires a simulation for each correlogram tested. Kooijman's original recommendation for estimating the variance of I/max/ can lead to negative variance estimates and should therefore not be used. The Sidak (1967) and Bonferroni methods, which are computationally very simple, are preferable to the Q-test when there are few distance classes and weak spatial pattern. As pattern intensity and number of distance classes increase, the Q-test becomes more powerful.

9903 Information Handling

31293 (ANL/TM—436) Computing Services Software Library. Clark, L.M.; Jones, W.H. (Argonne National Lab., IL (USA)). Mar 1986. Contract W-31-109-ENG-38. 52p. NTIS, PC A04/MF A01; GPO Dep. File Number DE86009491.

This technical memorandum serves as a practical guide for managers, supervisors, programmers, analysts, and other data processing personnel who need to consult the documentation or use the software available in the Software Library. Policies and procedures necessary to preserve the software documentation and protect the Laboratory's investment in software are presented. Included are sections on responsibilities of the Software Librarian and Software Coordinators, software change control policy, systems programming section software maintenance tools, information systems section software maintenance tools and use of the LIBRARY exec. The LIBRARY exec, which serves as the Master Index, provides on-line information about documents. 2 figs., 1 tab. (DWL)

31294 User interaction model for manipulation of large data sets. Thomas, J.J. (Pacific Northwest Lab., Richland, WA). pp 118-128 of Computer science and statistics: proceedings of the 14th symposium on the interface. Heiner, K.W.; Sacher, R.S.; Wilkinson, J.W. (eds.). New York, NY; Springer-Verlag (1983). Contract AC06-76RL01830.

From 14. symposium on the interface; Troy, NY, USA (5-7 Jul 1982).

The process of interactive data analysis on large data sets can be inhibited if not made impossible by a poorly designed interactive operating environment. This paper describes a two-way interaction model to illustrate the impact of large data sets on interactive data analysis with particular emphasis on the data manipulation language. This interaction model takes into account many of the principles in human factors and cognitive psychology. The model illustrates parallel as well as sequential environments for data manipulation with a high degree of control for the data analysis process. Examples of interaction sequences to illustrate the presented concepts are provided from an interactive data editor specifically designed for editing and subsetting large data sets. Experience gained in implementing a system tailored to analyze large data sets shows that the data set size has a direct impact on the human interface to a data management and analysis system. 25 references, 2 figures.

CORPORATE AUTHOR INDEX

In the Corporate Author Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the document title and the volume and abstract numbers. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German, are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes.

DOE Energy Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

A

Academia Sinica, Beijing (China). Inst. of Atomic Energy
Interstitial dislocation loop nucleation and growth and swelling produced by high-energy cascades, 11:31075 (R;US)

Aerospace Corp., El Segundo, CA (USA). Space Sciences Lab.
Hostile energetic particle radiation environments in earth's outer magnetosphere, 11:30809 (R;US)

Alberta Univ., Edmonton (Canada). Dept. of Mechanical Engineering
Air leakage flow correlations for varying house construction types, 11:30002 (R;US)

Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.
Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)
Microprocessor controller for mold heating and cooling. Final report, 11:30391 (R;US)
Polyimide scale-up in a new facility, 11:30332 (R;US)

Allied Corp., Morristown, NJ (USA). Corporate Technology
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)

ANG Coal Gasification Co., Beulah, ND (USA)
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)

Arbeitsgemeinschaft fuer Sparsamen und Umweltfreundlichen Energieverbrauch e.V. (ASUE), Frankfurt am Main (Germany, F.R.)
Ecological benefits of natural gas. A choice of illustrative papers, 11:30542 (R;DE;In German)

Argonne National Lab., Idaho Falls, ID (USA)
Measurements of $^{10}B(n,He)$ reaction rates in a mockup control rod in ZPPR, 11:29777 (R;US)

Argonne National Lab., IL (USA)
Bioconversion: a new technology for waste and sludge disposal. Workshop proceedings, 11:29460 (R;US)
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume I. Equations and numerics, 11:29800 (R;US)
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume II. User's manual, 11:29801 (R;US)
Computing Services Software Library, 11:31293 (R;US)
Diffractive hard scattering and the SSC, 11:30848 (R;US)
Electronic mail at ANL. Revision, 11:31276 (R;US)
Estimates of long-term trends in sulfur deposition, 11:30525 (R;US)
Gas-bubble growth mechanisms in the analysis of metal fuel swelling, 11:30082 (R;US)
Guide to sharing personal computer resources via local area networks, 11:31277 (R;US)
Handbook for quick cost estimates. A method for developing quick approximate estimates of costs for generic actions for nuclear power plants, 11:29788 (R;US)
K-meson production by nu/sub μ/-deuterium reactions near threshold: implications for nucleon-decay searches, 11:30824 (R;US)
Model for LMFBR core transient analysis in real-time, 11:29779 (R;US)
Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)
Radiation-induced segregation and precipitation in molybdenum-rhenium alloys, 11:30083 (R;US)
Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)
Scoping study of the potential effectiveness of an operational safety reliability program in addressing generic safety problems, 11:29860 (R;US)
Solute segregation and microstructural evolution in ion-irradiated vanadium-base alloys, 11:30084 (R;US)
US/JAERI calculational benchmarks for nuclear data and codes intercomparison. Article 8, 11:31032 (R;US)

Arizona Univ., Tucson (USA). Coll. of Engineering
Waste Management '85: Waste Isolation in the US - Technical Programs and Public Education. Volume 2. Waste policies and programs, low-level waste, 11:29317 (R;US)

Arizona Univ., Tucson (USA). Dept. of Chemical Engineering
Aerosol formation from pulverized coal combustion. Final technical report, 11:29186 (R;US)

Army Armament Research and Development Command, Dover, NJ (USA)
Spectral and parameter estimation problems arising in the metrology of high performance mirror surfaces, 11:30955 (R;US)

Associacao Brasileira de Quimica, Rio de Janeiro
Abstracts of the 26. Brazilian Congress on Chemistry, 11:30179 (R;BR;In Portuguese)

Association Euratom-CEA, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. de Recherches sur la Fusion Controlee
Identification of highly-ionized xenon spectra (Xe XXVI through Xe XXXI) excited in the plasma of the TFR Tokamak, 11:30966 (R;FR)
Theoretical and experimental study of modes associated to ion cyclotron heating on TFR, 11:30967 (R;FR;In French)

Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment
Canadian nuclear fuel waste management program, 11:29314 (R;CA)
Canadian Nuclear Fuel Waste Management Program. 1983 annual report, 11:29309 (R;CA)
Effect of pH on the stability of smectite, 11:30148 (R;CA)
Fuel characterization research for the Canadian Nuclear Fuel Waste Management Program, 11:29315 (R;CA)
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
Hydrothermal flow-through apparatus to simulate leaching of nuclear waste forms under quasi-dynamic conditions, 11:29431 (R;CA)

Hydrothermal stability of bentonite-based buffer materials, 11:30149 (R;CA)
Model for growth of beta-phase particles in zirconium-2.5 wt% niobium, 11:30119 (R;CA)
Photochemical method for radioiodine abatement, 11:29311 (R;CA)
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)
Thermal properties of clay-based buffer materials for a nuclear fuel waste disposal vault, 11:30147 (R;CA)
Two-phase natural circulation experiments in a pressurized water loop with CANDU geometry, 11:29776 (R;CA)
Use of the food-chain model FOOD III and the soil model SCEMR to assess irrigation as a biosphere pathway, 11:30579 (R;CA)
Verification tests of a high-temperature transverse creep model for Zr-2.5 wt % Nb pressure tubes, 11:30070 (R;CA)

Auburn Univ., AL (USA). Dept. of Physics
Complex geometric optics theory in an inhomogeneous plasma. Appendix B, 11:30962 (R;US)
Mode conversion of lower hybrid waves at high ion cyclotron harmonics. Appendix F, 11:30963 (R;US)
Theoretical studies of the heating of toroidal plasmas with radiofrequency electromagnetic radiation. Progress report, July 1, 1985-June 30, 1986, 11:30965 (R;US)

Australian National Univ., Canberra. Dept. of Nuclear Physics
Angular momentum partition in heavy ion induced fission and the effects of shells on gamma-ray multiplicities, 11:30914 (R;AU)
Determination of $B(E3;0_1^+ \rightarrow 3_1)$ values for the stable isotopes of cadmium, 11:30910 (R;AU)
Electron capture decay of ^{148}Tb, 11:30915 (R;AU)
G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
Heavy ion induced fusion/fission and barrier penetration. Lecture notes, 11:30929 (R;AU)
On the electron capture decay energies of ^{153}Gd and ^{175}Hf, 11:30917 (R;AU)
Quadrupole moment of ^{196}Pt - a crucial test of nuclear models, 11:30919 (R;AU)
Short lived isomers in ^{211}Rn and ^{210}Rn, 11:30920 (R;AU)
Spectroscopy of high spin states in sup(211,212,213)Fr, 11:30922 (R;AU)
Spectroscopy of ^{166}W and ^{167}W and alignment effects in very neutron-deficient tungsten nuclei, 11:30916 (R;AU)

B

Battelle Human Affairs Research Center, Seattle, WA (USA)
Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2, 11:29792 (R;US)

Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation
Geostatistical analysis of potentiometric data in Wolfcamp aquifer of the Palo Duro Basin, Texas, 11:30739 (R;US)

Baylor Univ., Houston, TX (USA). Coll. of Medicine
Development of tungsten-tantalum generator. Final report, 11:30310 (R;US)

Bechtel National, Inc., San Francisco, CA (USA)
Survey and assessment of radioactive waste management facilities in the United States. Section 2.5. Air-cooled vault storage facilities, 11:29299 (R;US)

Bedford Inst. of Oceanography, Dartmouth, Nova Scotia (Canada)
Geotechnical properties of fine-grained turbidite sequences: observations from the Nares Abyssal Plain, 11:30750 (R;US)

Bettis Atomic Power Lab., West Mifflin, PA (USA)
Fabrication and loading of fuel rods for the Light Water Breeder Reactor (LWBR Development Program), 11:29781 (R;US)

Bjorksten Research Labs., Inc., Madison, WI (USA)
Development of a continuous spinning process for producing silicon carbide - silicon nitride precursor fibers. Final report, 11:30121 (R;US)

Bordeaux-1 Univ., 33 - Gradignan (France). Centre d'Etudes Nucleaires
Mass energy correlation measurement in ^{252}Cf spontaneous fission, 11:30927 (R;FR;In French)

Bremer Arbeitsgemeinschaft fuer Ueberseeforschung und Entwicklung (Germany, F.R.)
Biogas workshop on community plants. Report, 11:29461 (R;DE)

British Geological Survey, Keyworth (UK)
Summary of the geothermal prospects for the United Kingdom. Final report of the British Geological Survey's Geomthermal Energy Programme 1979-1984, 11:29616 (R;GB)

Brookhaven National Lab., Upton, NY (USA)
Analysis of high pressure boil-off situation during MSIV closure ATWS in a typical BWR/4, 11:29826 (R;US)
Application of SLIM-MAUD: a test of an interactive computer-based method for organizing expert assessment of human performance and reliability. Volume 1. Main report, 11:29853 (R;US)
Comparison of the domain and frequency domain state feedbacks, 11:30392 (R;US)
Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)
Cross-sectional analysis of sulfate concentrations in the surface waters of New York and New England, 11:30608 (R;US)
Crystallography of icosahedral crystals, 11:30952 (R;US)
Distribution of sulfhydryl boranes in mice and rats, 11:30658 (R;US)
Effects of rod worth and drop speed on the BWR off-center rod drop accident, 11:29825 (R;US)
Geometry-independent approach to coarse-mesh neutron diffusion calculations, 11:29793 (R;US)
High flux research reactors based on particulate fuel, 11:29784 (R;US)
High power density reactors based on direct cooled particle beds, 11:29783 (R;US)
Independent analysis of selected core-concrete interaction and fission product release experiments with CORCON-MOD2 and VANESA, 11:29829 (R;US)
Load-cell-based weighing system for weighing 9.1 and 12.7-tonne UF_6 cylinders, 11:29452 (R;US)
Microwave undulator, 11:30415 (R;US)
Particle bed reactor propulsion vehicle performance and characteristics as an orbital transfer rocket, 11:29824 (R;US)
Plant analyzer development for high-speed interactive simulation of BWR plant transients, 11:29828 (R;US)
Review of issues related to improving nuclear power plant diesel generator reliability, 11:29803 (R;US)
Seismic and dynamic qualification of safety related electrical and mechanical equipment, 11:29850 (R;US)
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Spectral and parameter estimation problems arising in the metrology of high performance mirror surfaces, 11:30955 (R;US)
Transverse correlations in start-up of a free electron laser from noise, 11:30361 (R;US)
X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 11:30422 (R;US)
Zero models and pole models for multivariable systems, 11:30960 (R;US)

Brown Univ., Providence, RI (USA)
Theoretical studies of resonance enhance stimulated raman scattering (RESRS) of frequency doubled Alexandrite laser wavelengths in cesium vapor. Semiannual report, 11:30364 (R;US)

Brown Univ., Providence, RI (USA). Div. of Engineering
Active sites in char gasification. Quarterly technical progress report, 1 January-31 March 1986, 11:29160 (R;US)
Single-substance, two-phase duct flow: a unified theoretical and experimental study, 11:30377 (R;US)

Building Research Establishment, Watford (UK)
Assessment of the cost-effectiveness and potential of heat pumps for domestic hot water heating, 11:29993 (R;GB)

Building Services Research and Information Association, Bracknell (UK)
Factors influencing boiler efficiency, 11:29995 (R;GB)
Heat metering for domestic premises, 11:29994 (R;GB)
Bundesamt fuer Energiewirtschaft, Bern (Switzerland)
Thermal measurements in greenhouses attached to residential buildings. Climatic conditions - occupants - thermal comfort, 11:30013 (R;DE;In German)
Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)
Algeria - energy situation 1984, 11:29925 (R;DE;In German)
Brazil - energy situation 1984, 11:29932 (R;DE;In German)
Egypt - energy situation 1984, 11:29922 (R;DE;In German)
Ethiopia - energy situation 1984, 11:29933 (R;DE;In German)
France - energy situation 1984, 11:29926 (R;DE;In German)
Jamaica - energy situation 1984, 11:29923 (R;DE;In German)
Kuwait - energy situation 1984, 11:29929 (R;DE;In German)
Luxembourg - energy situation 1984, 11:29927 (R;DE;In German)
Malaysia - energy situation 1984, 11:29924 (R;DE;In German)
Oman - energy situation 1984, 11:29934 (R;DE;In German)
Switzerland - energy situation 1984, 11:29935 (R;DE;In German)
Togo - energy situation 1984, 11:29928 (R;DE;In German)
Tunisia - energy situation 1984/1985, 11:29930 (R;DE;In German)
Uganda - energy situation 1984, 11:29921 (R;DE;In German)
United Arab Emirates - energy situation 1984, 11:29937 (R;DE;In German)
Uruguay - energy situation 1984, 11:29931 (R;DE;In German)

C

California Coast Univ., Santa Ana (USA)
Analysis of the certification process of computer programs used in a nuclear power plant, using the management systems approach, 11:29846 (R;US)
California Inst. of Tech., Pasadena (USA). W.K. Kellogg Radiation Lab.
Microcanonical simulation of nuclear disassembly, 11:30937 (R;US)
California Univ., Berkeley (USA)
Vibration damping in externally pressurized gas bearings, 11:30353 (R;US)
California Univ., Berkeley (USA). Dept. of Mechanical Engineering
Intermittency and conditional velocities in premixed conical turbulent flames, 11:30324 (R;US)
California Univ., Los Angeles (USA). Dept. of Mechanical, Aerospace and Nuclear Engineering
Analysis and intercomparison of Phase I experiments at FNS. Article 9, 11:31033 (R;US)
California Univ., Los Angeles (USA). School of Engineering and Applied Science
US/JAERI calculational benchmarks for nuclear data and codes intercomparison. Article 8, 11:31032 (R;US)
California Univ., Santa Cruz (USA). Inst. for Particle Physics
Gluonium candidates from hadronic and e^+e^- interactions, 11:30845 (R;US)
Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics
Nonleptonic weak interactions in hypernuclei, 11:30896 (R;US)
CEA Centre d'Etudes de Bruyeres-le-Chatel, 92 - Montrouge (France)
Activation energies of recovery of the oxide charge created by ionizing pulse, energies being taken related to room temperature during irradiation and related to process oxidation temperature, 11:30150 (R;FR;In French)
Cold fragmentation in thermal neutron induced fission of ^{235}U, 11:30926 (R;FR)
Hot isostatic pressing of ceramics, 11:30120 (R;FR;In French)
Study of the hydridation of an uranium alloy containing 0.2 weight percent of vanadium, 11:30073 (R;FR;In French)
Use of a medical scanner for non-destructive control of composite materials, 11:30382 (R;FR;In French)
CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France)
Using last event estimator for detection calculations, 11:30945 (R;FR)
CEA Centre d'Etudes de Valduc, 21 - Is-sur-Tille (France)
Research program and uses of the solution fueled reactor SILENE, 11:29816 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France)
Experimental investigation of cobalt-60 accumulation and elimination in Cyprinus carpio (L.), 11:30690 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-les-Durance (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
Cadarache - 20 years of plutonium fuels, 11:29805 (R;FR;In French)
Versatile computer code for reactor neutronic calculation advances in qualification of the different modules, 11:29794 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Dept. d'Analyse de Surete
French study and research program on water cooled reactor safety, 11:29757 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
Corrosion studies on HLW steel containers, 11:29316 (R;FR)
Study of metallic materials behavior in low oxygen activity atmospheres, 11:30077 (R;FR;In French)
CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)
Post-neutron mass distribution for $^{232}U(nsub(th),f)$, 11:30925 (R;FR)
Quasi-particle excitations in low energy fission, 11:30924 (R;FR)
CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
3D reconstruction for diverging X-ray beams, 11:30660 (R;FR)
System architecture for high speed reconstruction in Time-Of-Flight positron tomography, 11:30659 (R;FR)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)
Food irradiation: a technology for the eighties, 11:29455 (R;FR)
High temperature mass spectrometry study on fast-neutrons-nuclear-reactor irradiated fuel, 11:29806 (R;FR)
Reactor antineutrino background at Gran Sasso, 11:30424 (R;FR)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Fondamentale (IRF)
About the obtention of static critical behaviours from the renormalization group techniques of field theory, 11:30879 (R;FR;In French)
Particle physics and gauge theories, 11:30849 (R;FR)
Pion photoproduction in nuclei, 11:30892 (R;FR)
Skyrmions, 11:30956 (R;FR)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Inst. de Recherche Technologique et de Developpement Industriel (IRDI)
Electronic structure of the uranium(IV)-tetrakis-1,1,1-trifluoro-4-phenylbutane-2,4-dionato: magnetochemical study, 11:30152 (R;FR;In French)
Field tests and examinations in cell of French fuel assemblies, 11:29758 (R;FR;In French)
Global methods for reinforced concrete slabs, 11:30151 (R;FR)
In-core measurements with platinum self powered detectors in a French PWR, 11:29756 (R;FR)
Influence of titanium on the tempering structure of austenitic steels, 11:30078 (R;FR;In French)
Production of a Raman laser at 16 μm, 11:29290 (R;FR;In French)
Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30072 (R;FR;In French)
Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30076 (R;FR;In French)
Study of crack inititation and propagation in heterogeneous welded joints, 11:30074 (R;FR;In French)
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
Welding of sule elements for nuclear reactors with solid state YAG laser using instrumentated testing equipments, 11:30075 (R;FR;In French)
CEA Etablissement de la Vallee du Rhone, 30 - Bagnols-sur-Ceze (France)
Uranium enrichment by solvent extraction, 11:29289 (R;FR)
Chicago Univ., IL (USA). Dept. of Physics
Bianchi models and new inflation, 11:30766 (R;US)

Chicago Univ., IL (USA). Enrico Fermi Inst.
Finite temperature instability for compactification, 11:30763 (R;US)
Probing the structure of the galactic halo with gamma rays produced by WIMP annihilations, 11:30764 (R;US)
Stable compactifications, 11:30880 (R;US)
Clermont-Ferrand-2 Univ., 63 - Aubiere (France)
Pion electroproduction at threshold in the inverse channel: $\pi p \rightarrow ne^+e$. Determination method of the longitudinal multipole Lsub(0+)sup(π) at small transfer. Preparation of the experiment, 11:30842 (R;FR;In French)
Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire
Pion electroproduction at threshold in the inverse channel: $\pi p \rightarrow ne^+e$. Determination method of the longitudinal multipole Lsub(0+)sup(π) at small transfer. Preparation of the experiment, 11:30842 (R;FR;In French)
Colorado School of Mines, Golden (USA). Dept. of Chemical Engineering and Petroleum Refining
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
Colorado Univ., Boulder (USA)
Extreme ultraviolet multilayer reflectors, 11:30341 (R;US)
COMEX Corp., Olympia, WA (USA)
Report to the NRC on guidance for preparing scenarios for emergency preparedness exercises at nuclear generating stations. Draft report for comment, 11:29851 (R;US)
Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Commission of the European Communities, Ispra (Italy). European Scientific Data Processing Center
Probabilistic analysis of the events: loss of electric power supply of the secondary coolant circuit pump related to the busbar AL1 AL2 and loss of power supply of the busbar ML1 ML2 of the primary coolant circuit of the SORA reactor, 11:29819 (R;FR;In Italian)
Commission of the European Communities, Ispra (Italy). Joint Research Centre
EURDYN-1D: a computer code for the one-dimensional non-linear dynamic analysis of structural systems. Description and users' manual (release 1), 11:31279 (R;FR)
Commission of the European Communities, Luxembourg
Analysis of maintenance and quality assurance measures for the different radioactive materials packagings in the member states of the European Community, 11:30338 (R;FR;In French)
Analysis of zircaloy rewetting experiments and their implication for reactor fuel, 11:29838 (R;FR)
Application of the methods of statistical analysis of pseudo-random signals to the interpretation of fields trials on the atmospheric transport of active products and to estimate of confidence limits, 11:30536 (R;FR)
Assessment of the dispersion of fission products in the atmosphere following a reactor accident under meteorological conditions of low wind speeds with or without high temporal and spatial variability in wind speed and direction, 11:30559 (R;FR)
Certification of carbon and nitrogen in molybdenum (BCR No. 23), 11:30178 (R;FR)
Characterization of the pressure field induced by the explosion in air of a hydrocarbon-air a mixture with slow deflagration or fast deflagration, 11:29798 (R;FR;In French)
Comparison of the tensile properties of 9-12% Cr. steels. (Pt. 1) data files, (Pt. 2) final report, 11:30094 (R;FR)
Contribution to the study of the mechanisms of coke formation, 11:29165 (R;XE;In French)
Corrosion behaviour of container materials for geological disposal of high level radioactive waste, 11:30092 (R;FR)
Critical evaluation of anaerobic fermentation of waste products 'a management study', 11:29484 (R;FR)
Demonstration of spent-fuel measurement equipment at KWO Obrigheim facility, 11:29766 (R;FR)
Developments in control systems for the thermal regime of batteries and coking of coal, 11:29164 (R;XE;In French)
Elasto-plastic benchmark calculations. Step 1: verification of the numerical accuracy of the computer programs, 11:31278 (R;FR)
EURDYN-1D: a computer code for the one-dimensional non-linear dynamic analysis of structural systems. Description and users' manual (release 1), 11:31279 (R;FR)
Experimental investigation of the acceleration of deflagration in wake flow, 11:30323 (R;FR)
Experimental investigation of the effect of clad ballooning on the effectiveness of PWR emergency cooling, 11:29839 (R;FR)
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Gas explosion characterization, wave propagation (half-scale experiments). Vol. 2, 11:30510 (R;FR)
Gas explosion characterization, wave propagation (small-scale experiments). Vol. 1, 11:30509 (R;FR)
Heat transfer to a dispersed two phase flow and detailed quench front velocity research, 11:29836 (R;FR)
High flux testing reactor Petten. Replacement of the reactor vessel and connected components. Overall report, 11:29820 (R;FR)
Local scale atmospheric diffusion at a coastal site in the presence of breeze effects (Phase I and II: data collection at a coastal site and off shore). Vol. 2, 11:30558 (R;FR)
On the adequacy of numerical codes for the simulation of vapour cloud explosions. Pt. 1, 11:30508 (R;FR)
Probabilistic analysis of the events: loss of electric power supply of the secondary coolant circuit pump related to the busbar AL1 AL2 and loss of power supply of the busbar ML1 ML2 of the primary coolant circuit of the SORA reactor, 11:29819 (R;FR;In Italian)
Progress in circulating fluidized bed firing for steam generation and use of low value fuels and coals, 11:29218 (R;FR;In German)
Research on erosion and corrosion of cobalt-free materials, 11:30093 (R;FR;In German)
Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 1, 11:29840 (R;FR)
Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 2, 11:29841 (R;FR)
Study of explosive demolition techniques for heavy reinforced and prestressed concrete structures, 11:29835 (R;FR)
Study of rewetting and quench phenomena by single pin out-of-pile experiments, with special emphasis on the effect of pin composition, 11:30379 (R;FR)
Study of the conditions of formation and emission of trace element pollutants from the combustion of coal in industrial fires, 11:29199 (R;XE)
Study of two-dimensional effects in the core of a light water reactor during the ECC'S phase following a loss of coolant accident, 11:29837 (R;FR)
Consiglio Nazionale delle Ricerche, Florence (Italy). Lab. di Elettronica Quantistica
Measurements of neutral constituents using far infrared remote sensing techniques, 11:30539 (R;IT)
Council for Scientific and Industrial Research, Pretoria (South Africa). National Chemical Research Lab.
[Council for Scientific and Industrial Research, National Chemical Research Lab.]. Annual report 1985, 11:30193 (R;ZA;In Afrikaans)

D

David W. Taylor Naval Ship Research and Development Center, Annapolis, MD (USA)
Application of the key curve and multi-specimen techniques to dynamic J-R Curve testing of alloy steel, 11:30104 (R;US)
Department of Energy, Glasgow (UK)
Offshore oil and gas. A bibliography, 11:29230 (R;GB)
Department of Energy, London (UK)
Anaerobic digestion and biocatalysis, 11:29485 (R;GB)
Department of Energy, Washington, DC (USA)
Anaerobic digestion and biocatalysis, 11:29485 (R;GB)
Department of Scientific and Industrial Research, Wellington (New Zealand)
Seismic surveys at Blackburn, Buller coal fields, New Zealand, 11:29202 (R;NZ)

Deutscher Wetterdienst, Hohenspeissenberg (Germany, F.R.). Meteorologisches Observatorium
Ozone measurements near the ground and in the atmosphere in the first half-year 1985, 11:30541 (R;DE;In German and English)
Deutsches Inst. fuer Entwicklungspolitik G.m.b.H., Berlin (Germany, F.R.)
Development potential and policies in the South Arabian countries Yemen Arab Republic, People's Democratic Republic of Yemen, Sultanate of Oman, 11:29938 (R;DE)
Dominion Engineering, Inc., McLean, VA (USA)
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA)
Scientific basis for Nuclear Waste Management VIII, 11:29428 (B;US)
Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.
Feasibility study of wood stork foraging habitat mapping using landsat multispectral data, 11:30595 (R;US)
Fiber optic modification of a diode array spectrophotometer, 11:30496 (R;US)
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)
Modeling of convective mixing downstream of separately heated annuli, 11:30378 (R;US)
Transport of nitrate from a large cement based waste form, 11:29436 (R;US)
Vegetational stress detection in a southeastern swamp floodplain using remote sensing and in-situ spectral measurements, 11:30620 (R;US)

E

Earth Technology Corp., Long Beach, CA (USA)
Evaluation of the structure and stratigraphy over Richton Dome, Mississippi, 11:30738 (R;US)
Ebasco Services, Inc., New York (USA)
Intact decommissioning of nuclear power plants: a dose assessment, 11:29747 (R;US)
EG and G Energy Measurements, Inc., Las Vegas, NV (USA)
Aerial radiological survey of the Feed Materials Production Center and surrounding area, Fernald, Ohio. Date of survey: April 1985, 11:30583 (R;US)
EG and G Idaho, Inc., Idaho Falls (USA)
Proceedings of the seventh annual participants' information meeting. DOE Low-Level Waste Management Program, 11:29399 (R;US)
Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)
Supercritical binary geothermal cycle experiments with mixed-hydrocarbon working fluids and a vertical, in-tube, counterflow condenser, 11:29629 (R;US)
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
Ultrasonic inspection of partially completed welds using pattern recognition techniques, 11:30384 (R;US)
US Department of Energy Three Mile Island research and development program. 1985 annual report, 11:29843 (R;US)
EG and G, Inc., Los Alamos, NM (USA). Los Alamos Operations
BUARO PSD vs height, 11:30808 (R;US)
EG and G/Washington Analytical Services Center, Inc., Morgantown, WV (USA)
Great Plains Gasification Project process stream design data, 11:29157 (R;US)
Electricite de France, 78 - Chatou
Ten years of sodium cooled steam generator tests on the C.G.V.S. Synthesis of the results obtained on these equipments and operation experiments of an industrial size test facility, 11:29780 (R;FR;In French)
Electricite de France, 75 - Paris
D.E.R. 84 panorama E.D.F. progress report, 11:29746 (R;FR;In French)
Electricity Council, London (UK)
Commercial aspects of CHP and private generation: an Electricity Supply Industry viewpoint, 11:29677 (R;GB)
ENEA, Casaccia (Italy). Dipartimento Fonti Alternative e Risparmio Energetico
Assessing environmental effects of oil-fuelled energy systems, 11:30527 (R;IT)
ENEA, Casaccia (Italy). Direzione Centrale Studi - Unita Valutazioni Ambientali e Socioeconomiche
Assessing environmental effects of oil-fuelled energy systems, 11:30527 (R;IT)
ENEA, La Spezia (Italy). Dipartimento Protezione Ambientale e Salute dell'Uomo
Pollution problems in border karst regions, 11:30610 (R;IT)
ENEA, Rome (Italy)
DNA repair in PHA stimulated human lymphocytes, 11:30691 (R;IT;In Italian)
Energy and Environmental Analysis, Inc., Arlington, VA (USA)
1975, 1976 Energy Consumption Data Base for the Industrial Sector. Volume 3. Computer-related documentation. Final report, 11:29948 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report, 11:29979 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume IA. Appendices with 1975 data. Final report, 11:29946 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report, 11:29980 (R;US)
Energy and Environmental Research Corp., Irvine, CA (USA)
Kinetics of nitrogen and sulfur reactions in combustion systems. Quarterly report No. 3, 11:29187 (R;US)
Environmental Protection Agency, Washington, DC (USA)
Exploration of the relationships among acidic deposition, land use, and water chemistry, 11:30578 (R;US)
Environmental Protection Agency, Washington, DC (USA). Office of Water Regulations and Standards
Perspectives on nonpoint source pollution - proceedings of a national conference, 11:29188 (R;US)
European Organization for Nuclear Research, Geneva (Switzerland)
Heavy flavour photoproduction and decay, 11:30850 (R;US)
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
European Space Agency, 75 - Paris (France)
Proceedings of ESA sessions at the 16th IEEE annual power electronics specialists conference, 11:29506 (R;FR)

F

Fermi National Accelerator Lab., Batavia, IL (USA)
Bianchi models and new inflation, 11:30766 (R;US)
Effect of inflation on anisotropic cosmologies, 11:30765 (R;US)
Finite temperature instability for compactification, 11:30763 (R;US)
Introduction to the nonlinear dynamics arising from magnetic multipoles, 11:30412 (R;US)
Non-static vacuum strings: exterior and interior solutions, 11:30767 (R;US)
Probing the structure of the galactic halo with gamma rays produced by WIMP annihilations, 11:30764 (R;US)
Stable compactifications, 11:30880 (R;US)
Finnish Energy Economy Association, Helsinki
Calculation of the consumption of electric energy in buildings, 11:29996 (R;FI;In Finnish)
Compensation of reactive power in buildings, 11:29998 (R;FI;In Finnish)
Elimination of quality fluctuations of milled peat in transportation phase and cost caused by these fluctuations, 11:29209 (R;FI;In Finnish)
Energy consumption variations in pulp and paper industry, 11:30029 (R;FI;In Finnish)

Energy economical pilot projects in building industry, 11:29997 (R;FI;In Finnish)
Heat pumps for district heating of smaller cities, 11:30024 (R;FI;In Finnish)
Improvement of the energy economy of industrial lightning, 11:30025 (R;FI;In Finnish)
National energy information system for Finland, 11:29917 (R;FI;In Finnish)
Physical properties of spent liquor from chemical pulping processes, 11:30028 (R;FI;In Finnish)
Possibilities of using sludge for energy purposes, 11:30027 (R;FI;In Finnish)
System development of availability statistics on thermal power plants, 11:29675 (R;FI;In Finnish)
Vapour recompression evaporation of black liqour, 11:30026 (R;FI;In Finnish)
Water chemistry control and analytical methods at medium pressure power plants, 11:29676 (R;FI;In Finnish)

Fleming (W.S.) and Associates, Inc., Syracuse, NY (USA)
Residential earth-coupled heat pump demonstration. Final report, 11:30014 (R;US)

Florida Governor's Energy Office, Tallahassee (USA)
Energy data, 1970-1984, 11:29920 (R;US)

Florida State Univ., Tallahassee (USA)
Guard cell biochemistry: response to environmental stimuli causing changes in gas exchange, 11:29501 (R;US)

Florida State Univ., Tallahassee (USA). Dept. of Chemistry
Radiochemistry of uranium, neptunium and plutonium: an updating, 11:30311 (R;US)

Fluor Technology, Inc., Irvine, CA (USA). Advance Technology Div.
Great Plains Coal Gasification Plant start-up and modification report, 11:29154 (R;US)

Fracture Control Corp., Goleta, CA (USA)
Failure assessment techniques to ensure shipping container integrity, 11:30347 (R;US)

Frankfurt Univ. (Germany, F.R.). Fachbereich Humanmedizin
Axial skeleton malformations induced by 5 fluoro-2'-desoxycytidine (FCdR) and X-rays in mice of the breeding strains C57Bl/6JHanFfm, C57Bl/10JFfm, and in hamsters of the GHFfm breeding strain. A comparative evaluation considering gestation stages and dose-response-relationships, 11:30692 (R;DE;In German)

Franklin McLean Memorial Research Inst., Chicago, IL (USA)
Quantitative studies in radiopharmaceutical science. Progress report, January 1-December 31, 1985, 11:30663 (R;US)

G

GA Technologies, Inc., San Diego, CA (USA)
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Comparison of experimentally-inferred ion thermal diffusivities with neoclassical theory for neutral beam-heated discharges in the Doublet III tokamak, 11:30969 (R;US)
Cw dye laser system for Li beam spectroscopy in a tokamak, 11:30972 (R;US)
Development of ferritic steels for reduced activation: the US program, 11:30081 (R;US)
Finite-beta global MHD stabilities for circular and highly-elongated tokamaks with and without poloidal divertors, 11:30970 (R;US)
High-pressure catalytic metal reactor in a simulated solar central receiver, 11:29513 (R;US)
ICRH coupling in DIII-D, 11:31028 (R;US)
Physics analysis database for the DIII-D tokamak, 11:31069 (R;US)
Plasma density and poloidal field measurements on text using an injected lithium beam, 11:30971 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
Testing of the DHLW truck shipping cask, 11:30350 (R;US)

General Accounting Office, Washington, DC (USA). Resources, Community and Economic Development Div.
Hazardous waste. Federal agency hazardous waste disposal at Kettlemen Hills, California, 11:29936 (R;US)
Nuclear regulation. Oversight of quality assurance at nuclear power plants needs improvement, 11:29787 (R;US)

General Electric Co., Largo, FL (USA). Neutron Devices Dept.
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)

General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center
Computed tomography of coals. Quarterly technical progress report No. 8, July 1-September 30, 1984, 11:29156 (R;US)

Geological Survey, Denver, CO (USA)
Computer method to detect and correct cycle skipping on sonic logs, 11:30746 (R;US)
Preliminary analysis of geophysical logs from the WT series of drill holes, Yucca Mountain, Nye County, Nevada, 11:30748 (R;US)

Geological Survey, Denver, CO (USA). Water Resources Div.
Inflow to a crack in playa deposits of Yucca Lake, Nevada Test Site, Nye County, Nevada, 11:30745 (R;US)

Geological Survey, Menlo Park, CA (USA)
Permeability and pore-fluid chemistry of the Bullfrog Tuff in a temperature gradient: summary of results, 11:30761 (R;US)
Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings, 11:30747 (R;US)

Geological Survey, Reston, VA (USA)
Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)
Structure and uranium deposits of the Salina Quadrangle, Utah, 11:29288 (R;US)
Vegetation and climates of the last 45,000 years in the vicinity of the Nevada Test Site, south-central Nevada, 11:30744 (R;US)

Geological Survey, Santa Rosa, CA (USA)
Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings, 11:30747 (R;US)

Geological Survey, Washington, DC (USA)
Estimated use of water in the US in 1980, 11:30603 (R;US)
Geologic disposal of high-level radioactive wastes: Earth-science perspectives, 11:29401 (R;US)

Georgia Inst. of Tech., Atlanta (USA). Georgia Technology Research Inst.
Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985, 11:30234 (R;US)

Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)
Evaluation of criteria for the application of systems-analytical methods for safety analyses of chemical plants, 11:30390 (R;DE;In German)

Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.)
Cadmium retention in the kidneys of chicks as influenced by phytate in the feed, 11:30718 (R;DE;In German)

GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)
Investigations of the vibrational corrosion of structural steels in seawater, 11:30095 (R;DE;In German)

GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Werkstofftechnologie und Chemie
Investigations of the vibrational corrosion of structural steels in seawater, 11:30095 (R;DE;In German)

Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)
Excitations in grazing heavy ion reactions, 11:30931 (R;FR)

Grenoble-1 Univ., 38 (France)
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus, 11:30912 (R;FR;In French)

Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Towards temperature dependant nuclear forces for the description of hot nuclei, 11:30936 (R;FR)
X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus, 11:30912 (R;FR;In French)

Grenoble-1 Univ., 38 - La Tronche (France)
Contribution to the study of radioactive and heavy jets discharged in the presence of a cross-stream, 11:30560 (R;FR;In French)
Grumman Aerospace Corp., Bethpage, NY (USA)
ICRF wave propagation and absorption in axisymmetric mirrors. Annual report, July 1, 1985-February 28, 1986, 11:30964 (R;US)

H

H and R Technical Associates, Inc., Oak Ridge, TN (USA)
Improvements in release probability by using an overpack, 11:29298 (R;US)
Hanford Engineering Development Lab., Richland, WA (USA)
Development of ferritic steels for reduced activation: the US program, 11:30081 (R;US)
Full scale tests on remote handled FFTF fuel assembly waste handling and packaging, 11:30340 (R;US)
Insights into the fracture toughness of martensitic stainless steels using stereoscopic fractographic measurements, 11:30096 (R;US)
Light Water Reactor Pressure Vessel Surveillance Dosimetry Improvement Program. PSF Blind Test workshop minutes. Summary, 11:29750 (R;US)
Microstructural examination of pure copper and three copper alloys irradiated in FFTF, 11:30097 (R;US)
Use of remote systems and automation in radioactive waste shipping and receiving, 11:29306 (R;US)
Use of robotics for radioactive waste shipping and receiving, 11:29307 (R;US)
Hawaii Univ., Honolulu (USA). Hawaii Natural Energy Inst.
Geothermal research at the Puna Facility. Technical report, 11:29642 (R;US)
Helsinki Univ. of Technology, Otaniemi (Finland). Internal Combustion Engine Lab.
Alcohol as a fuel in a high speed diesel engine with double injection system, 11:30041 (R;FI;In Finnish)
Cold-start tests with speed diesel engines using alcohol as main fuel, 11:30042 (R;FI;In Finnish)
Endurance test of a high speed diesel engine using ethanol fuel, 11:30038 (R;FI;In Finnish)
Exhaust gas analysis of a diesel engine using alcohol as a fuel, 11:30040 (R;FI;In Finnish)
Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines, 11:30037 (R;FI;In Finnish)
Practical properties of ethanol used as a fuel in diesel engine supercharged in different ways, 11:30039 (R;FI;In Finnish)
Hiroshima Univ., Takehara (Japan). Research Inst. for Theoretical Physics
On a quantized scalar field in the combined de Sitter-Nariai universe, 11:30805 (R;JP)
Human Reliability Associates Ltd., Parbold, Lancashire (UK)
Application of SLIM-MAUD: a test of an interactive computer-based method for organizing expert assessment of human performance and reliability. Volume 1. Main report, 11:29853 (R;US)
Human Resources Management, Inc., Washington, DC (USA)
Summary report on International Solar Commercialization/ International Market Development Program, 11:29496 (R;US)

I

ICF, Inc., Washington, DC (USA)
Development of financial statements for the domestic petroleum industry, 1977, 11:29244 (R;US)
Economic assessment of effects of royalties, severance taxes, and diligent development requirements on coal production, prices, and consumer costs. Draft final report, 11:29228 (R;US)
Idaho National Engineering Lab., Idaho Falls (USA)
Diffraction moire of dynamic events, 11:30383 (R;US)
Illinois Inst. of Tech., Chicago (USA). Dept. of Physics
Diffractive hard scattering and the SSC, 11:30848 (R;US)
Illinois Univ., Chicago (USA). Dept. of Chemical Engineering
Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)
Illinois Univ., Urbana (USA)
Electron spin mapping of coal molecular structure by ENDOR. Quarterly technical progress report, 11:29181 (R;US)
Illinois Univ., Urbana (USA). Dept. of Chemical Engineering
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)
Illinois Univ., Urbana (USA). Dept. of Electrical and Computer Engineering
Comparison of Clifford and Grassmann algebras in applications to electromagnetics. Revision 1, 11:30959 (R;US)
Illinois Univ., Urbana (USA). Dept. of Metallurgy and Mining Engineering
Radiation-induced segregation and precipitation in molybdenum-rhenium alloys, 11:30083 (R;US)
Institut National Polytechnique, 38 - Grenoble (France)
Contribution to the study of radioactive and heavy jets discharged in the presence of a cross-stream, 11:30560 (R;FR;In French)
Instituto de Fisica Teorica, Sao Paulo (Brazil)
Multiple images of our galaxy in closed, multiply connected cosmologies, 11:30770 (R;BR)
Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)
Pyranometer comparison at INPE, Atibaia, in August 1983, 11:30497 (R;BR)
International Centre for Theoretical Physics, Trieste (Italy)
Alpha-clustering in 75 MeV $^{16}O+^{40}Ca$ as a collective mass fragmentation process, 11:30908 (R;XA)
Canonical ensemble redefined - 2: Magnetic systems, 11:30957 (R;XA)
Charged-particle multiplicity distributions in e^+e annihilation and negative binomial distributions, 11:30860 (R;XA)
Construction of local-scale transformed wave functions and its application to ATDHF, 11:30932 (R;XA)
Cosmic numbers and quantum theory, 11:30768 (R;XA)
Critical dimensions for strings in a curved background, 11:30881 (R;IT)
Do superstrings lead to quarks or to preons, 11:30861 (R;XA)
Low-energy hadron physics in the virton quark model, 11:30857 (R;XA)
Microscopic study of the S band in the generator co-ordinate approach, 11:30918 (R;XA)
On the hadron as a microuniverse, 11:30862 (R;XA)
Proton decay via d=5 gluino dressed graphs with flavour diagonal gluino couplings in supergravity models, 11:30859 (R;XA)
Roton-like excitation in superfluid helium-4, 11:30820 (R;XA)
Stability of SU(2) monopole in the presence of chiral fermions analysed on computers, 11:30858 (R;XA)
Superconformal invariance and the tensor multiplet in six dimensions, 11:30882 (R;IT)
Universe created from 'nothing' as a broken symmetry theory of gravity, 11:30769 (R;XA)
International Energy Agency Coal Research, London (UK)
An overview of international NO/sub x/ control regulations, 11:29229 (R;GB)
Assessment of atmospheric fluidised bed combustion techniques, 11:29219 (R;GB)
Fundamentals of bulk solids flow, 11:29211 (R;GB)
Physical coal beneficiation and electricity costs, 11:29210 (R;GB)
International School of Advanced Studies, Trieste (Italy)
Critical dimensions for strings in a curved background, 11:30881 (R;IT)
International Trade Administration, Washington, DC (USA)
Coal: evolving supply and demand in world seaborne steam coal trade, 11:29225 (R;US)
Iowa State Univ. of Science and Technology, Ames (USA)
Eluent and ligand effects in cation chromatography, 11:30185 (D;US)
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)

Formation of benzene by the pyrolysis of 4-vinylcyclohexene regiospecific formation of anthracenes in the pyrolysis of dibenzosuberones and related systems, 11:30271 (D;US)
I. Kinetic and mechanistic study of the [4+4] dimerization of 2,3-dimethylene-2,3-dihydrofuran. II. Preparation of 2,3-dimethylene-2,3-dihydrobenzo[B]furan by the flash vacuum pyrolysis of 2-methyl-3-benzo[B]furylmethyl benzoate. III. Reaction of 2,3-dimethylene-2,3-dihydrofuran with triplet oxygen, 11:30270 (D;US)
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys, 11:30099 (R;US)
Nuclear magnetic resonance studies of amorphous silicon hydrides: proton spin dynamics, 11:30223 (D;US)
Selectivity variations in anion chromatography, 11:30184 (D;US)

I. T. Corp., Carlsbad, NM (USA)
Thermomechanical modeling of the Spent Fuel Test-Climax, 11:30756 (R;US)

J

Japan Atomic Energy Research Inst., Tokai, Ibaraki
Analysis and intercomparison of Phase I experiments at FNS. Article 9, 11:31033 (R;US)
US/JAERI calculational benchmarks for nuclear data and codes intercomparison. Article 8, 11:31032 (R;US)

Japan Atomic Energy Research Inst., Tokai, Ibaraki. Japanese Nuclear Data Committee
Attempt for revision of JNDC FP Decay Data File, 11:30913 (R;JP)

Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment
Evaluation of neutron nuclear data of ^{9}Be for JENDL-3, 11:30903 (R;JP)
Evaluation of neutron nuclear data of ^{6}Li for JENDL-3, 11:30901 (R;JP)
Evaluation of neutron nuclear data of ^{7}Li for JENDL-3, 11:30902 (R;JP)
Neutron nuclear data of ^{9}Be adopted in JENDL-2, 11:30900 (R;JP)
Neutron nuclear data of ^{7}Ni adopted in JENDL-2, 11:30899 (R;JP)

Jet Propulsion Lab., Pasadena, CA (USA)
High-efficiency silicon solar-cell design and practical barriers, 11:29504 (R;US)
Microwave limb sounder for stratospheric measurements, 11:30181 (R;US)
Sensitivity analysis of central station flat-plate photovolaic systems and implications for National Photovoltaics Program planning, 11:29559 (R;US)

Joint Inst. for Nuclear Research, Dubna (USSR)
Low-energy hadron physics in the virton quark model, 11:30857 (R;XA)

K

Kansas Univ., Lawrence (USA)
K-meson production by nu/sub μ/-deuterium reactions near threshold: implications for nucleon-decay searches, 11:30824 (R;US)

Kansas Univ., Lawrence (USA). Dept. of Electrical and Computer Engineering
Evolving directions of PC applications in electromagnetics analysis and design, 11:31288 (R;US)

Kashmir Univ., Srinagar (India). Dept. of Physics
Roton-like excitation in superfluid helium-4, 11:30820 (R;XA)

Kent State Univ., OH (USA)
Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985, 11:30237 (R;US)

Kentucky Univ., Lexington (USA). Dept. of Agronomy
Depletion of photosystem 2 extrinsic proteins. I. Effects of O_2 and N_2 flash yields and steady state O_2 evolution, 11:29502 (R;US)

Keplinger Technology Consultants, Inc., Tulsa, OK (USA)
Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie der Nuklearen Entsorgung
Solidification of enriched tritium from reprocessing, 11:29402 (R;DE;In German)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung
Radiation-induced segregation in light-ion bombarded Ni-8% Si, 11:30088 (R;US)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Sicherheitsforschung
Application of the finite element method to problems with heat radiation exchange, 11:30380 (R;DE;In German)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Plasmaphysik
Real-time evaluation of electron and current density profile parameters on TEXTOR, 11:30973 (R;DE)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung
Closed thorium cycles in the pebble bed HTR, 11:29775 (R;DE)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Projektleitung Energieforschung
Implementing agreement for co-operation in the development of large scale wind energy conversion systems, 11:29653 (R;DE)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Medizinische Abt.
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)

Komenskeho Univ., Bratislava (Czechoslovakia)
Low-energy hadron physics in the virton quark model, 11:30857 (R;XA)

Kommunale Technologie-Beratung Ruhrgebiet G.m.b.H., Oberhausen (Germany, F.R.)
Analyzing the applicability of black coal in public buildings of the Ruhr District, 11:30012 (R;DE;In German)

L

Laseronics, Inc., Los Angeles, CA (USA)
Resonantly enhanced third-harmonic generation and multiphoton ionization in cesium vapor, 11:30811 (R;US)

Lawrence Berkeley Lab., CA (USA)
Air leakage flow correlations for varying house construction types, 11:30002 (R;US)
Comparison of the design and costs of induction linac drivers for inertial fusion using ions of differing mass, 11:30409 (R;US)
Description of ASHRAE's proposed data tightness standard, 11:30000 (R;US)
Design of tough ferritic steels for cryogenic use, 11:30100 (R;US)
Detailed thermal performance data on conventional and highly insulating window systems, 11:30003 (R;US)
Detection of charged particles in amorphous silicon layers, 11:30425 (R;US)
Electric overhead traveling cranes: procedures for certification, inspection, and preventive maintenance, 11:30343 (R;US)
Heat pipe effects in nuclear waste isolation: a review, 11:29405 (R;US)
Induction period for ignition of fuel sprays at high temperatures and pressures, 11:30033 (R;US)
Intermittency and conditional velocities in premixed conical turbulent flames, 11:30324 (R;US)
Low energy cyclotron for radiocarbon dating, 11:30410 (R;US)
Measured results of energy conservation retrofits in residential buildings, 11:30004 (R;US)
Microcanonical simulation of nuclear disassembly, 11:30937 (R;US)
Monitored performance of new, low-energy homes: updated results from the BECA-A data base, 11:30001 (R;US)
Multiple-porosity method for simulation of naturally fractured petroleum reservoirs, 11:29235 (R;US)

Muon catalyzed fusion, 11:31077 (R;US)
Proton and deuterium NMR experiments in zero field, 11:30814 (R;US)
Relationship between critical current and microstructure of internal tin wire, 11:30342 (R;US)
Size fractionation of black and organic particulate carbon from fires. Final report, 11:30537 (R;US)
Solid electrolyte for high energy density batteries, 11:29902 (R;US)
Structure in the universe from massive neutrinos, 11:30783 (R;US)
Thermal and ion-assisted reactions of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine, 11:30161 (R;US)
Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings, 11:30747 (R;US)

Lawrence Livermore National Lab., CA (USA)
Accurate measurement of small rotations by modulating polarization. Final report, 11:30500 (R;US)
ARC-OLOGY via TELL-A-GRAF, 11:31289 (R;US)
Chemistry research resource. Progress report, March 1986, 11:30175 (R;US)
Coatings for high energy applications. The Nova laser, 11:31083 (R;US)
Comparison of Clifford and Grassmann algebras in applications to electromagnetics. Revision 1, 11:30959 (R;US)
Comparison of the design and costs of induction linac drivers for inertial fusion using ions of differing mass, 11:30409 (R;US)
Constructing a coherent long-term global total ozone climatology from the BUV, MFR, and SBUV/TOMS data sets, 11:30810 (R;US)
Database tools for enhanced analysis of TMX-U data. Revision 1, 11:30984 (R;US)
Design and use of zonally-averaged climate models, 11:30519 (R;US)
Determining plasma-fueling sources with an end-loss ion spectrometer. Revision 1, 11:31082 (R;US)
Discrimination of NTS explosions and western United States earthquakes: data processing, 11:30518 (R;US)
Evaluation and design of a large spacing loop-loop electromagnetic tool, 11:30354 (R;US)
Evolving directions of PC applications in electromagnetics analysis and design, 11:31288 (R;US)
Expert system to control a fusion energy experiment, 11:31084 (R;US)
ICRF heating of passing ions in TMX-U, 11:30985 (R;US)
Inelastic deformations of fault and shear zones in granitic rock, 11:30757 (R;US)
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Ion diffusion at interfaces in hot plasmas, 11:30983 (R;US)
Local and global deposition of radioactivity: a reassessment, 11:30697 (R;US)
MVUSRS utility reference manual, 11:31287 (R;US)
Nuclear chemistry at Rochester, 11:30315 (R;US)
Operating efficiencies of a Lysholm helical expander for Brayton-cycle heat engines, 11:30407 (R;US)
Progress in developing the smoke source term for "nuclear winter" studies: major uncertainties, 11:30545 (R;US)
Propagation of long, high-power microwave pulses through the air, 11:30331 (R;US)
Quasi-static and dynamic arbitrary fracture propagation in jointed rock, 11:29252 (R;US)
Question of consistent boundary conditions when simulating reversed field pinch dynamics. Revision 1, 11:30986 (R;US)
Radiochemistry of uranium, neptunium and plutonium: an updating, 11:30311 (R;US)
Spent Fuel Test-Climax mineby revisited, 11:29418 (R;US)
Stripline insulation design analysis by partial discharge measurements, 11:29564 (R;US)
Thermal and ion-assisted reactions of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine, 11:30161 (R;US)
Thermomechanical modeling of the Spent Fuel Test-Climax, 11:30756 (R;US)
Tissue-equivalent torso phantom for calibration of transuranic-nuclide counting facilities, 11:30951 (R;US)
Training and development and education at Lawrence Livermore National Laboratory, 11:31273 (R;US)
Vibration damping in externally pressurized gas bearings, 11:30353 (R;US)

Lockheed Palo Alto Research Labs., CA (USA)
X-ray signature of solar coronal mass ejections, 11:30789 (R;GB)

London School of Economics and Political Science (UK). Dept. of Social Psychology
Application of SLIM-MAUD: a test of an interactive computer-based method for organizing expert assessment of human performance and reliability. Volume 1. Main report, 11:29853 (R;US)

Los Alamos National Lab., NM (USA)
Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility, 11:29844 (R;US)
Diffusion approximation for modeling of 3-D radiation distributions, 11:30948 (R;US)
Directions for improved fusion reactors, 11:31076 (R;US)
Effects of physical properties on the initiation behaviors of heterogeneous high explosives, 11:30512 (R;US)
Evolution of free-electron laser development, 11:30362 (R;US)
Exploration for Hot Dry Rock geothermal resources in the Midcontinent USA. Volume 1. Introduction, geologic overview, and data acquisition and evaluation, 11:29622 (R;US)
Extreme ultraviolet multilayer reflectors, 11:30341 (R;US)
Foundations of statistical crack mechanics, 11:30958 (R;US)
Gain physics of rf-linac-driven xuv free-electron lasers, 11:30363 (R;US)
High explosive modeling in 2D Euler code for shaped charge problems, 11:30511 (R;US)
Hostile energetic particle radiation environments in earth's outer magnetosphere, 11:30809 (R;US)
Hydrodynamic models for novae with ejecta rich in oxygen, neon and magnesium, 11:30785 (R;US)
Interstitial dislocation loop nucleation and growth and swelling produced by high-energy cascades, 11:31075 (R;US)
Investigation of the strength of H440 graphite when subjected to combined primary and secondary stress, 11:30162 (R;US)
Massive neutrinos in particle physics and astrophysics, 11:30872 (R;US)
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys, 11:30099 (R;US)
Mechanism of thermal decomposition of krypton difluoride, 11:30233 (TJ;US)
Memorandum - optical radiation danger when using RSV, 11:30730 (TG;US)
Muon catalyzed fusion, 11:31077 (R;US)
Numerics for the simulation of electromagnetic-field propagation in nonionized and plasma media, 11:30975 (R;US)
Prospects for improved fusion reactors, 11:31074 (R;US)
Radial buildup to detonation in pentaerythritol tetranitrate (PETN), 11:30514 (R;US)
Radiation transport. Progress report, April 1, 1985-June 30, 1985, 11:29795 (R;US)
Regeneration and recycle of spent oxide reduction solvent salts used in pyrochemical plutonium recovery operations at Los Alamos, 11:29294 (R;US)
RFQ scaling-law implications and examples, 11:30413 (R;US)
Simple blast model for structural design, 11:30513 (R;US)
Subsurface moisture regimes and tracer movement under two types of trench-cap designs for shallow land burial sites, 11:29403 (R;US)
Technique for megabar controlled strain experiments, 11:30098 (R;US)
Technology development for the design of waste repositories at arid sites: field studies of biointrusion and capillary barriers, 11:29404 (R;US)
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Transient absorption of light induced by radiation, 11:30160 (R;US)

Los Alamos Technical Associates, Inc., NM (USA)
Operational procedures for receiving, packaging, emplacing, and retrieving high-level and transuranic waste in a geologic repository in tuff, 11:29417 (R;US)

Lund Univ. (Sweden). Dept. of Plant Ecology
Fertilization with peat and wood ashes - effects on biomass production, nutrient balance and uptake of heavy metals, 11:29547 (R;SE;In Swedish)

Lyon-1 Univ., 69 - Villeurbanne (France)
Study of reducing pyrohydrolysis of uranyl fluoride into uranium dioxide, 11:29291 (R;FR;In French)

M

Magma Gulf/Technadril, Houston, TX (USA)
Sweet Lake geopressured-geothermal project, Magma Gulf-Technadril/DOE Amoco fee. Volume III. Final report. Annual report, February 1982-March 1985, 11:29638 (R;US)
Mallinckrodt, Inc., St. Louis, MO (USA). Medical Products R and D
Radiochemistry of uranium, neptunium and plutonium: an updating, 11:30311 (R;US)
Manville Service Corp., Denver, CO (USA)
High temperature calorimeter performance variable study, 11:30498 (R;US)
Marburg Univ. (Germany, F.R.). Fachbereich Humanmedizin
Radiobiological studies on eggs of the rice weevil (Tribolium confusum) after exposure to heavy primary particles of the cosmic radiation, 11:30693 (R;DE;In German)
Martek Corp., Columbia, MD (USA)
Depletion of photosystem 2 extrinsic proteins. I. Effects of O_2 and N_2 flash yields and steady state O_2 evolution, 11:29502 (R;US)
Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA)
Environmental surveillance of the Oak Ridge Reservation and surrounding environs during 1985, 11:30584 (R;US)
Martin Marietta Labs., Baltimore, MD (USA). Biosciences Dept.
Depletion of photosystem 2 extrinsic proteins. I. Effects of O_2 and N_2 flash yields and steady state O_2 evolution, 11:29502 (R;US)
Maryland Univ., Baltimore (USA). Dept. of Pathology
Environmental carcinogens in human target tissues in culture. Progress report, 11:30715 (R;US)
Massachusetts Dept. of Public Health, Boston (USA)
Massachusetts Crystalline Repository Project. Progress report, December 31, 1985, 11:29400 (R;US)
Massachusetts Inst. of Tech., Cambridge (USA)
Building materials research agenda, 11:30016 (R;US)
Polydisperse coal slurry rheology. Quarterly report, 11:29179 (R;US)
Massachusetts Inst. of Tech., Cambridge (USA). High Voltage Research Lab.
Stripline insulation design analysis by partial discharge measurements, 11:29564 (R;US)
Materials Engineering Associates, Inc., Lanham, MD (USA)
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
McDonnell Douglas Astronautics Co., St. Louis, MO (USA)
Folded waveguide cavity coupler for ICRF heating, 11:31027 (R;US)
ICRF heating technology development activities at Oak Ridge National Laboratory, 11:31026 (R;US)
Meeting Planning Associates, Menlo Park, CA (USA)
Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 1. Extrapolation from animals to man, 11:30716 (R;US)
Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 2. Toxicokinetics, 11:30717 (R;US)
Memory Metals, Inc., Stamford, CT (USA)
Shape memory alloy seals for geothermal applications, 11:29637 (R;US)
Michigan Technological Univ., Houghton (USA). Inst. of Materials Processing
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Michigan Univ., Ann Arbor (USA). Dept. of Chemical Engineering
Improving the stability of coal slurries. Quarterly and half-yearly report, September 15-December 15, 1985 and September 15, 1985-March 15, 1986, 11:29206 (R;US)
Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.
Fouling control in cooling systems using brackish water, 11:29681 (R;FI;In Finnish)
Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study, 11:29999 (R;FI;In Finnish)
Missouri Univ., Rolla (USA)
Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)
Monsanto Research Corp., Miamisburg, OH (USA). Mound
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Mound activities in chemical and physical research: July-December 1985, 11:30196 (R;US)
Montana Dept. of Fish, Wildlife and Parks, Kalispell (USA)
Ural-Tweed bighorn sheep - wildlife mitigation project. Annual report, 1 September 1984-31 December 1985, 11:30590 (R;US)
Muenchen Univ. (Germany, F.R.). Fachbereich Tiermedizin
Cadmium retention in the kidneys of chicks as influenced by phytate in the feed, 11:30718 (R;DE;In German)

N

National Aeronautical Establishment, Ottawa, Ontario (Canada)
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center
Composition optimization of self-lubricating chromium carbide-based composite coatings for use to 760°C, 11:30091 (R;US)
Effect of argon and hydrogen on deposition of silicon from tetrachlorosilane in cold plasmas, 11:30123 (R;US)
Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics, 11:30122 (R;US)
Simulating a small turboshaft engine in real-time multiprocessor simulator (RTMPS) environment, 11:30035 (R;US)
Space photovoltaic research and technology 1985: high efficiency, space environment, and array technology, 11:29516 (R;US)
Specimen geometry effects on graphite/PMR-15 composites during thermo-oxidative aging, 11:30144 (R;US)
Thermal aging effects in refractory metal alloys, 11:29786 (R;US)
National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center
Excitation of the iron Kα feature in solar flares, 11:30788 (R;GB)
Heavy ion compositional signature in ^{3}He-rich solar particle events, 11:30786 (R;US)
Single scattering from nonspherical Chebyshev particles: a compendium of calculations, 11:30888 (R;US)
National Aeronautics and Space Administration, Hampton, VA (USA). Langley Research Center
Airborne Lidar measurements of aerosols, mixed layer heights, and ozone during the 1980 PEPE/NEROS summer field experiment, 11:30538 (R;US)
Earth Radiation Budget Experiment (ERBE) scanner instrument anomaly investigation, 11:30426 (R;US)
Multiprocessor sparse L/U decomposition with controlled fill-in. Final report, 11:31280 (R;US)
Partitioning problems in parallel, pipelined and distributed computing. Final Report, 11:31282 (R;US)
National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center
Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions, 11:30784 (R;US)
National Aeronautics and Space Administration, Washington, DC (USA)
Present state of knowledge of the upper atmosphere: an assessment report, 11:30540 (R;US)
National Aerospace Lab., Chofu, Tokyo (Japan)
Evaluation of cold isostatic pressing for high pressure thrust chambers, 11:30101 (R;JP)
Proceedings of the 2nd NAL symposium on aircraft computational aerodynamics, 11:30325 (R;JP)

National Bureau of Standards, Washington, DC (USA)
Inorganic compounds for passive solar energy storage. Solid-state dehydration materials and high specific heat materials. Progress report, 11:29612 (R;US)
National Bureau of Standards, Washington, DC (USA). Center for Building Technology
Initial test results and test plan for differential temperature controllers used in solar energy systems, 11:29600 (R;US)
National Lab. for High Energy Physics, Oho, Ibaraki (Japan)
Proceedings of the first TRISTAN phase II workshop, 11:30831 (R;JP)
Proceedings of the workshop on 'monopoles and proton decay', 11:30822 (R;JP)
National Marine Fisheries Service, Portland, OR (USA). Environmental and Technical Services Div.
Monitoring of downstream salmon and steelhead at federal hydroelectric facilities. Annual report 1985, 11:29493 (R;US)
National Marine Fisheries Service, Seattle, WA (USA). Coastal Zone and Estuarine Studies Div.
Smolt passage behavior and flow-net relationship in the forebay of John Day Dam. Final report 1985, 11:29494 (R;US)
Study to determine the biological feasibility of a new fish tagging system. Annual report 1984, 11:30685 (R;US)
National Oceanic and Atmospheric Administration, Boulder, CO (USA). Space Environment Lab.
X-ray signature of solar coronal mass ejections, 11:30789 (R;GB)
National Research Council, Washington, DC (USA). Numerical Data Advisory Board
Assessment of the current status of basic nuclear data compilations, 11:30890 (R;US)
Naval Academy, Annapolis, MD
Application of the key curve and multi-specimen techniques to dynamic J-R Curve testing of alloy steel, 11:30104 (R;US)
Nevada Univ., Reno (USA). Desert Research Inst.
Gas exchange characteristics of leaves as indicators of the basic limitations to the rate of photosynthesis. Second annual report, 1 June 1985-31 May 1986, 11:29503 (R;US)
New Mexico Health and Environment Dept., Santa Fe (USA). Environmental Evaluation Group
Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
New Mexico Inst. of Mining and Technology, Socorro (USA). New Mexico Petroleum Recovery Research Center
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
New Mexico Univ., Albuquerque (USA)
Scientific basis for Nuclear Waste Management VIII, 11:29428 (B;US)
New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
New Mexico Univ., Albuquerque (USA). Dept. of Mechanical Engineering
Kinematic modelling and graphic simulation of path planning for mobile vehicles, 11:30351 (R;US)
New South Wales Univ., Kensington (Australia)
Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests, 11:29603 (R;US)
New York Dept. of Labor, Brooklyn (USA). Radiological Health Unit
Auburn Steel Company radioactive contamination incident, 11:29408 (R;US)
New York Univ., NY (USA). Inst. of Environmental Medicine
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Nez Perce Tribe, Lapwai, ID (USA). Fisheries Resource Management
Biological and physical inventory of the streams within the Nez Perce Reservation. Synopsis of three years of stream inventory on the Nez Perce Reservation. Final report 1985, 11:30621 (R;US)
North Carolina State Univ., Raleigh (USA)
Effects of high energy radiation on the mechanical properties of epoxy-graphite fiber reinforced composites. Interim report, 1 January- 31 December 1985, 11:30145 (R;US)
Northwestern Univ., Evanston, IL (USA). Dept. of Chemistry
Supported f-element complexes: surface chemistry and catalysis. Final report, August 15, 1984-January 14, 1986, 11:30195 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Material Safety and Safeguards
Staff evaluation of US Department of Energy proposal for monitored retrievable storage, 11:29300 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation
Investigation of the contributors to wrong unit or wrong train events, 11:29849 (R;US)
Nuclear Regulatory Commission Human Factors Program Plan. Revision 2, 11:29848 (R;US)
Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499), 11:29847 (R;US)
Technical specifications, Palo Verde Nuclear Generating Station, Unit No. 2 (Docket No. 50-529). Appendix A to License No. NPF-51, 11:29773 (R;US)
Nuclear Regulatory Commission, Washington, DC (USA). Office of Resource Management
Licensed operating reactors. Status summary report, data as of February 28, 1986. Volume 10, No. 3, 11:29789 (R;US)
Nuclear Research Centre, Inshas (Egypt)
Asymptotic time dependent neutron transport in multidimensional systems, 11:30944 (R;EG)
Simulated borehole for ore depth evaluation by neutron capture gamma-ray technique using Pu/Be neutron source, 11:30507 (R;EG)
NUS Corp., Gaithersburg, MD (USA)
Assessment of the use of half-square cans on the management of spent fuel, 11:29301 (R;US)

O

Oak Ridge Associated Universities, Inc., TN (USA)
Nuclear engineering enrollments and degrees, 1985, 11:31271 (R;US)
Oak Ridge Gaseous Diffusion Plant, TN (USA)
Comparison of a boundary element and finite element solution of an electrochemical plating problem, 11:30328 (R;US)
International Atomic Energy Agency UF_6 cascade header pipe test loop: safety assessment, 11:29453 (R;US)
Load-cell-based weighing system for weighing 9.1 and 12.7-tonne UF_6 cylinders, 11:29452 (R;US)
Thermal analysis of UF_6 cylinder inside a protective overpack, 11:30385 (R;US)
Oak Ridge National Lab., TN (USA)
Acid-split flowsheets for uranium-plutonium partitioning without a reductant, 11:29293 (R;US)
Alpha counting and spectrometry using liquid scintillation methods, 11:30312 (R;US)
Application of a geographic information system in the study of acidic deposition, 11:30609 (R;US)
Assessment of the safety implications of control at the Oconee 1 nuclear plant. Final report, 11:29854 (R;US)
Automated sensitivity analysis using the GRESS language, 11:30741 (R;US)
Biology Division progress report, October 1, 1984-September 30, 1985, 11:30720 (R;US)
Characterization of the National Low-Temperature Neutron Irradiation Facility, 11:29818 (R;US)
Chemical vapor infiltration of fiber-reinforced ceramic composites, 11:30143 (R;US)
Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States, 11:30524 (R;US)
Compact ignition tokamak design studies, 11:31024 (R;US)
Compact ignition tokamak design studies, 11:31025 (R;US)
Compact ignition tokamak design studies: design and analysis listing and examples. Documentation listing, 11:31068 (R;US)
Computational methodology for the Oak Ridge Research Reactor (ORR) and Bulk Shielding Reactor (BSR): the VICTORR input processing code for the BOLD VENTURE system. Volume 2, 11:29821 (R;US)

Configuration development and structural assessment of the FEDC ignitor concept, 11:31030 (R;US)
Consolidated Fuel Reprocessing Program. Progress report, October 1-December 31, 1985, 11:29296 (R;US)
Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)
Description of a research reactor control system using a programmable controller, 11:29817 (R;US)
Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501, 11:29855 (R;US)
Design, synthesis and evaluation of 2-deoxy-2-iodovinyl-branched carbohydrates as potential brain imaging agents, 11:30652 (R;US)
Design, synthesis and evaluation of redox radiopharmaceuticals: a potential new approach for the development of brain imaging agents, 11:30651 (R;US)
Development of ferritic steels for reduced activation: the US program, 11:30081 (R;US)
Directions for improved fusion reactors, 11:31076 (R;US)
Drop testing at the Oak Ridge National Laboratory, 11:30333 (R;US)
Effect of cold work on tensile behavior of irradiated type 316 stainless steel, 11:30086 (R;US)
Effect of neutron irradiation on the tensile properties and microstructure of several vanadium alloys, 11:30085 (R;US)
Effects of time and other variables on fission product release rates, 11:29748 (R;US)
Eighth annual progress report on special purpose materials for magnetically confined fusion reactors, 11:31067 (R;US)
Evaluation of the Motor-Operated Valve Analysis and Test System (MOVATS) to detect degradation, incorrect adjustments, and other abnormalities in motor-operated valves, 11:29802 (R;US)
Exploration of the relationships among acidic deposition, land use, and water chemistry, 11:30578 (R;US)
Fixation of waste materials in grouts. Part II. An empirical equation for estimating compressive strength for grouts from different wastes, 11:29409 (R;US)
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Future directions in intermediate energy heavy ion physics. A proposed expansion of the Holifield Facility, 11:30411 (R;US)
Glove box operations for transplutonium element production, 11:30336 (R;US)
Hazardous Waste Remedial Actions Program: integrating waste management, 11:29445 (R;US)
Head-end and solvent extraction studies using fast-flux test facility fuel, 11:29292 (R;US)
Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research, 11:29859 (R;US)
ICRF heating technology development activities at Oak Ridge National Laboratory, 11:31026 (R;US)
ICRH coupling in DIII-D, 11:31028 (R;US)
Improvements in release probability by using an overpack, 11:29298 (R;US)
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 11:30090 (R;US)
Ion damage microstructures in a Fe-10Cr-6Mo-0.5Nb ferritic steel, 11:30087 (R;US)
Light emission from metal-insulator-metal structures biased near breakdown voltages, 11:30393 (R;US)
Local transport of vertically- and horizontally-emitted sodium oxide aerosols, 11:29778 (R;US)
Magnetic susceptibility of CfN, CfAs, and CfSb, 11:30190 (R;US)
Maintainability features of the compact ignition tokamak, 11:31031 (R;US)
Nuclear plant aging research program activities, 11:29833 (R;US)
Nuclear Safety: technical progress review, April-June 1986. Volume 27, No. 2 , 11:29866 (R;US)
Nucleon-meson cascade calculations by Monte Carlo methods, 11:30946 (R;US)
Photosynthetic water splitting. Annual report, March 1, 1985-February 28, 1986, 11:29546 (R;US)
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)
Pressurized thermal shock evaluation of the Calvert Cliffs Unit 1 Nuclear Power Plant, 11:29774 (R;US)
Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)
Proposed production of a large (~40μg) sample of ^{254}Es, 11:30308 (R;US)
Pulsatile fluidic pump demonstration and predictive model application, 11:29295 (R;US)
PWR hybrid computer model for assessing the safety implications of control systems, 11:29858 (R;US)
Radiation-induced segregation in light-ion bombarded Ni-8% Si, 11:30088 (R;US)
Reduction of plutonium(IV) using photochemically generated uranium(IV), 11:30313 (R;US)
Report brief. Category: evaluation and modeling, 11:30015 (R;US)
Resonantly enhanced third-harmonic generation and multiphoton ionization in cesium vapor, 11:30811 (R;US)
Respiratory Protection Program. Programmatic description, 11:30737 (R;US)
Science, technology, and society, 11:30735 (R;US)
State and data techniques for control of discontinuous systems, 11:29809 (R;US)
Stirling machines: adiabatic to isothermal, 11:30048 (R;US)
Subcriticality measurements for two coupled uranyl nitrate solution tanks using ^{252}Cf-source-driven neutron noise analysis methods, 11:30335 (R;US)
Synthesis and biological evaluation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid, a new dimethyl-branched long-chain fatty acid to evaluate regional myocardial fatty acid uptake, 11:30661 (R;US)
System studies of compact ignition tokamaks, 11:31029 (R;US)
Tellurium behavior in containment under light water reactor accident conditions, 11:29856 (R;US)
TSORT - an automated tool for allocating tasks to training strategies, 11:29791 (R;US)
US DOT Specification 6M radioactive fissile material package nuclear criticality safety re-evaluation, 11:30334 (R;US)
Use of high-pressure ion exchange for the production of gadolinium-153. Status report, 11:30314 (R;US)
Vanadium alloys for fusion reactor first wall application, 11:30089 (R;US)
Version of ORIGEN2 with automated sensitivity-calculation capability, 11:29398 (R;US)

Oak Ridge Y-12 Plant, TN (USA)
Computer simulation of quenching uranium-0.75% titanium penetrator blanks. Final report for FY 1984, 11:30106 (R;US)

Oesterreichische Akademie der Wissenschaften, Vienna
Muon catalyzed fusion, 11:31077 (R;US)

Ohio State Univ., Columbus (USA). Dept. of Welding Engineering
400 Hz welding transformer gun assembly evaluation. Final report, 11:30394 (R;US)
400 Hz welding transformer gun assembly evaluation. Final report, 11:30395 (R;US)

Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
Phase behavior of coal fluids: data for correlation development. Report for the period: November 1, 1985-January 31, 1986, 11:29176 (R;US)

Old Dominion Univ., Norfolk, VA (USA)
Investigation of chemically-reacting supersonic internal flows. Progress report, 11:30034 (R;US)

Oregon Univ., Eugene (USA). Inst. of Theoretical Physics
Diffractive hard scattering and the SSC, 11:30848 (R;US)

Oregon Univ., Eugene (USA). Solar Monitoring Lab.
Pacific Northwest Solar Radiation Data, 11:29497 (R;US)

Oxford Univ. (UK). Mathematical Inst.
Constrained Lagrangian theory for monopoles, 11:30886 (R;GB)
Gauge theories in loop space, 11:30885 (R;GB)

P

Pacific Northwest Labs., Richland, WA (USA)
Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)

Assessment of spent nuclear fuel shipping cask handling capabilities of commercial light water reactors, 11:29304 (R;US)
Biomass thermochemical conversion program. 1985 annual report, 11:29486 (R;US)
BWR spent fuel storage cask performance test. Volume 1. Cask handling experience and decay heat, heat transfer, and shielding data, 11:29303 (R;US)
Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)
General design of a technical assistance program to help DOE/ prime contractor buyers in doing business with small disadvantaged businesses, 11:31272 (R;US)
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Hanford regulated laundry: inventory control and production improvement study, 11:30344 (R;US)
Hanford site water table changes 1950-1980: data observations and evaluation, 11:30604 (R;US)
Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2, 11:29792 (R;US)
Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual, 11:29450 (R;US)
Operating radioactive liquid-fed ceramic melter system, 11:29411 (R;US)
Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences, 11:30696 (R;US)
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Recommendations to the NRC on human engineering guidelines for nuclear power plant maintainability, 11:29852 (R;US)
Relevance of biotic pathways to the long-term regulation of nuclear waste disposal. Estimation of radiation dose to man resulting from biotic transport: the BIOPORT/MAXI1 software package. Volume 5, 11:29446 (R;US)
Report to the NRC on guidance for preparing scenarios for emergency preparedness exercises at nuclear generating stations. Draft report for comment, 11:29851 (R;US)
Review of light water reactor regulatory requirements. Identification of regulatory requirements that may have marginal importance to risk. Volume 1, 11:29753 (R;US)
Temperature history for canistered fuel lag storage areas during the loss of cooling air at the receiving and handling building of the MRS Facility, 11:29302 (R;US)
Treatment strategies for transuranic wastes, 11:29412 (R;US)
Value of solar thermal industrial process heat, 11:29601 (R;US)

Paris-6 Univ., 75 (France)
Contribution to the study of superconducting magnets, 11:30339 (R;FR;In French)
High accuracy measurement of the total cross section and of the real part of the scattering amplitude πi p from 2 to 14 GeV/c, 11:30841 (R;FR;In French)
Theoretical and experimental study of modes associated to ion cyclotron heating on TFR, 11:30967 (R;FR;In French)

Paris-6 Univ., 75 (France). Lab. de Physique Nucleaire et de Hautes Energies
High accuracy measurement of the total cross section and of the real part of the scattering amplitude π^+p from 2 to 14 GeV/c, 11:30841 (R;FR;In French)

Paris-11 Univ., 91 - Orsay (France)
Automatic measurement of characteristic quantities of nuclear plasma, 11:30968 (R;FR;In French)
Pressure and irradiation effects on transport properties of samarium compounds with instable valence, 11:30155 (R;FR;In French)
Study of some direct reactions at 0° in $^{18}O+^{26}Mg$ and $^{18}O+^{12}C$ systems, 11:30897 (R;FR;In French)

Paris-11 Univ., 91 - Orsay (France). Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse
Study of transitional Erbium nuclei (N=86) at very high spin. Highlight of dipolar transitions and medium lifetimes in the continuum, 11:30909 (R;FR;In French)

Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire
Gamma-decay of the 1gsub(9/2) and 2p inner-hole states in ^{111}Sn via the $^{112}Sn(^3He)$ reaction at 32 MeV, 11:30911 (R;FR)
Non-leptonic hyperon decays in the chiral bag model, 11:30865 (R;FR)
Radial injection in the Orsay cryogenic cyclotron project, 11:30408 (R;FR;In French)
Study of some direct reactions at 0° in $^{18}O+^{26}Mg$ and $^{18}O+^{12}C$ systems, 11:30897 (R;FR;In French)

Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire
Depolarization effects in a ring equipped with snakes, 11:30421 (R;FR)
DM2 results on hadronic and radiactive J/psi decays, 11:30837 (R;FR)
DM2 results on J/psi decays, 11:30839 (R;FR)
Measurement of the F_2sup(γ) photon structure function at LEP, 11:30874 (R;FR)
New particle searches at e^+e machines, 11:30838 (R;FR)
Search of prompt electrons in the NA14 photoproduction experiment at the CERN, 11:30836 (R;FR;In French)
Selected results on J/psi hadronic decays from DM2 and Mark III, 11:30840 (R;FR)
Some aspects of the physics at LEP with the Delphi detector, 11:30873 (R;FR)
Spin-transparent vertical beam kicker, 11:30420 (R;FR)

Paris-11 Univ., 91 - Orsay (France). Lab. de Physique des Plasmas
Electron energy distributions and excitation rates in high-frequency argon discharges, 11:30977 (R;FR)
S3T working group. Report 1: group aims, 11:30976 (R;FR;In French)

Phillips Petroleum Co., Bartlesville, OK (USA)
Prospects for improved fusion reactors, 11:31074 (R;US)

Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Abt. Mechanik
Problems of large-volume gas flow measurements in the high and low pressure range. Proceedings, 11:29253 (R;DE;In German)

Pickard, Lowe, and Garrick, Inc., Washington, DC (USA)
RISKMAN3: an interactive computer code to assist in the review and quantification of system analyses, 11:29867 (R;US)

Princeton Univ., NJ (USA). Dept. of Chemical Engineering
Model for the flow of particulate matter with application to chutes. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29205 (R;US)

Princeton Univ., NJ (USA). Dept. of Chemistry
Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986, 11:30194 (R;US)

Princeton Univ., NJ (USA). Plasma Physics Lab.
Characterization of the TFTR plasma edge by Langmuir-calorimeter probes, 11:30980 (R;US)
Maintainability features of the compact ignition tokamak, 11:31031 (R;US)
Method for determining fast-alpha-particle confinement in tokamak plasmas using resonant nuclear reactors, 11:30978 (R;US)
Model for electron cooling by radiation losses in plasmas: application to soft x-ray laser development, 11:31078 (R;US)
Numerical determination of the magnetic field line Hamiltonian, 11:31079 (R;US)
Numerical modeling of lower hybrid heating and current drive, 11:30979 (R;US)
Pressure limits of an axisymmetric torus, 11:30981 (R;US)

Punjab Univ., Chandigarh (India). Dept. of Physics
Alpha-clustering in 75 MeV $^{16}O+^{40}Ca$ as a collective mass fragmentation process, 11:30908 (R;XA)

Purdue Research Foundation, Lafayette, IN (USA)
Ink jet printing of silver metallization for photovoltaics. Quarterly technical report, January 1-March 31, 1986, 11:29505 (R;US)

Purdue Univ., Lafayette, IN (USA). Dept. of Chemistry
New mass spectral methods for coal characterization. Final report, July 15, 1982-September 14, 1985, 11:29174 (R;US)
Reactions of metal ions and their clusters in the gas phase using laser ionization: ion cyclotron resonance spectroscopy. Progress report, July 1, 1985-June 30, 1986, 11:30235 (R;US)

Purdue Univ., Lafayette, IN (USA). Lab. of Renewable Resources Engineering
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)

R

Radians Innova AB, Gothenburg (Sweden)
Memorandum - optical radiation danger when using RSV, 11:30730 (TG;US)

Rensselaer Polytechnic Inst., Troy, NY (USA)
Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986, 11:30236 (R;US)

RE/SPEC, Inc., Albuquerque, NM (USA)
Early results from the thermal/structural in situ test series at the WIPP, 11:30751 (R;US)
Expected thermal and hydrothermal environments for waste emplacement holes based on G-tunnel heater experiments, 11:30749 (R;US)

RE/SPEC, Inc., Rapid City, SD (USA)
Comparison between predicted and measured south drift closures at the WIPP using a transient creep model for salt, 11:30752 (R;US)

Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA). Occupational Safety
Cross-index to DOE-prescribed occupational safety codes and standards, 11:30736 (R;US)

Rio de Janeiro Univ. (Brazil). Inst. de Fisica
Excitation function and half-life for the fission isomer sup(240m) Pu from the $^{238}U(\alpha, 2n)$ sup(240m) Pu reaction, 11:30928 (R;BR)

Rockwell International Corp., Canoga Park, CA (USA)
Measurements of $^{10}B(n,He)$ reaction rates in a mockup control rod in ZPPR, 11:29777 (R;US)

Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant
Waste Systems progress report, March 1984-February 1985, 11:29413 (R;US)

Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations
Characterization and anion exchange removal of uranium from Hanford ground water, 11:30616 (R;US)
Preliminary Hanford Waste Vitrification Plant waste form qualification plan, 11:29416 (R;US)
Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
State of in situ stresses determined by hydraulic fracturing at the Hanford Site, 11:29415 (R;US)
Structure and evolution of the Horse Heaven Hills in South-Central Washington, 11:29414 (R;US)

Rockwell International Corp., Thousand Oaks, CA (USA). Science Center
Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)

Rome Univ. (Italy)
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)

Ronson Management Corp., Alexandria, VA (USA)
Development of new business opportunities for minorities in the synthetic fuels program. Executive summary. Final report, August 11, 1980-June 27, 1981, 11:29941 (R;US)

Rutherford Appleton Lab., Chilton (UK)
Collective motions in dense fluids observed in neutron scattering, 11:30949 (R;GB)
Constant scattering length fits to low energy Kp interactions, 11:30844 (R;GB)
Constrained Lagrangian theory for monopoles, 11:30886 (R;GB)
Excitation of the iron Kα feature in solar flares, 11:30788 (R;GB)
Extragalactic Infrared Astronomy, 11:30790 (R;GB)
Gauge theories in loop space, 11:30885 (R;GB)
Jet fragmentation, 11:30875 (R;GB)
Lifetime measurements of hadrons containing heavy quarks at PETRA and PEP, 11:30843 (R;GB)
Low frequency electromagnetic field computation in three dimensions, 11:30329 (R;GB)
X-ray signature of solar coronal mass ejections, 11:30789 (R;GB)

S

Sanders Associates, Inc., Nashua, NH (USA). Defense and Information Systems Div.
Parabolic dish module experiment. Final test report, 11:29607 (R;US)

Sandia National Labs., Albuquerque, NM (USA)
Aeroelastic effects in the structural dynamic analysis of vertical axis wind turbines, 11:29664 (R;US)
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Analysis of triaxial testing using a fracture damage model, 11:30386 (R;US)
Comparison between predicted and measured south drift closures at the WIPP using a transient creep model for salt, 11:30752 (R;US)
Control of precious metal plating baths using electrogravimetric analysis, 11:30330 (R;US)
Coupling of aerosol removal mechanisms in rising bubbles, 11:29813 (R;US)
Development of a large unyielding target for packaging tests, 11:30348 (R;US)
Early results from the thermal/structural in situ test series at the WIPP, 11:30751 (R;US)
Effects of wellbore liquids in propellant-based fracturing, 11:29251 (R;US)
Elastic and viscoelastic model of the stress history of sedimentary rocks, 11:30754 (R;US)
Estimated burst power requirements for selected SDI missions, 11:30346 (R;US)
Estimates of maximum trappable ion beam power in plasma channels, 11:30982 (R;US)
Evaluation of cooling channel configurations for actively cooled limiters, 11:31081 (R;US)
Expected thermal and hydrothermal environments for waste emplacement holes based on G-tunnel heater experiments, 11:30749 (R;US)
Experience with hydraulic fracturing tests for stress measurements in the WIPP, 11:30753 (R;US)
Fluid flow in a fractured rock mass, 11:30742 (R;US)
FY 1984 and FY 1985 geochemistry and materials studies in support of the Magma Energy Extraction Program, 11:29639 (R;US)
Geotechnical properties of fine-grained turbidite sequences: observations from the Nares Abyssal Plain, 11:30750 (R;US)
Hydrogen:air:steam flammability limits and combustion characteristics at intermediate scale, 11:29861 (R;US)
Improved shielding calculations for the particle beam fusion accelerator PBFA II, 11:31080 (R;US)
Improving security communications at fixed-site facilities, 11:29454 (R;US)
Innovative point-focus concentrator projects, 11:29608 (R;US)
Kinematic modelling and graphic simulation of path planning for mobile vehicles, 11:30351 (R;US)
Methods for verifying strain gage installations, 11:30345 (R;US)
Microscopic image analysis of slow crack growth in vitreous materials, 11:30388 (R;US)
Operational procedures for receiving, packaging, emplacing, and retrieving high-level and transuranic waste in a geologic repository in tuff, 11:29417 (R;US)
Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)
Practical paradigm for parallel processing problems, 11:31284 (R;US)
Qualification testing evaluation (QTE) program, FIN A-1051, Case 0686. Bimonthly status report, February-March 1986, 11:29797 (R;US)
Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)
Reconnection gun, 11:30352 (R;US)
Remote maintenance robot system for a pulsed nuclear reactor, 11:29822 (R;US)
Research directions in solid dynamics, 11:30387 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
Revision of Primary Standards Laboratory's methods to calculate water vapor pressures, 11:31286 (R;US)

Sensor-driven, fault-tolerant control of a maintenance robot, 11:29823 (R;US)
Solution chemistry of silicate and borate materials, 11:30163 (R;US)
Target hardness comparison to IAEA unyielding target, 11:30349 (R;US)
Testing of the DHLW truck shipping cask, 11:30350 (R;US)
Three dimensional modeling of the wedge pillar portion of the WIPP Geomechanical Evaluation (Room G) in situ experiment, 11:30755 (R;US)
Use of an acoustic borehole televiewer to investigate casing corrosion in geothermal wells, 11:29623 (R;US)
Use of remote systems and automation in radioactive waste shipping and receiving, 11:29306 (R;US)
Use of robotics for radioactive waste shipping and receiving, 11:29307 (R;US)
Verification study of SHELL SHOCK, 11:31285 (R;US)

Sandia National Labs., Livermore, CA (USA)
Evaluation of heliostat field/receiver configurations, 11:29609 (R;US)
SNLL materials testing compression facility, 11:30389 (R;US)

San Diego State Univ., CA (USA). Systems Ecology Research Group
Potential responses of tundra ecosystems to perturbations from energy development. Part I. Annual report, 1983, 11:30591 (R;US)

San Francisco State Univ., CA (USA)
Local and global deposition of radioactivity: a reassessment, 11:30697 (R;US)

Santa Clara Univ., CA (USA)
Research and development of alcohol fuel useage in spark-ignited engines, 11:30069 (R;US)

Sao Paulo Univ. (Brazil). Inst. de Fisica
Statistical principle and the quarks, 11:30863 (R;BR)

Schweizerisches Inst. fuer Nuklearforschung, Villigen
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys, 11:30099 (R;US)

Scicon Ltd., London (UK)
Design review of the SYVAC Executive, November 1984-February 1985, 11:29440 (R;GB)

Science Applications International Corp., Los Altos, CA (USA)
Department of Energy extended burnup data base. Final report, 11:29749 (R;US)

S-Cubed, La Jolla, CA (USA)
Quasi-static and dynamic arbitrary fracture propagation in jointed rock, 11:29252 (R;US)

Sloan-Kettering Inst. for Cancer Research, New York (USA). Biophysics Lab.
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)

Societe Franco-Americaine de Constructions Atomiques (FRAMATOME), 92 - Courbevoie (France)
FRAMATOME PWR technological development, 11:29767 (R;FR)
FRAMATOME studies on high conversion water reactor concept, 11:29769 (R;FR)
Maintenance and repair tools of the 900 MW PWR units in France, 11:29771 (R;FR;In French)
Project of the advanced PWR reactor N4, at Chooz, 11:29768 (R;FR;In French)
Steam generator replacement, 11:29772 (R;FR)
Structural analysis of PWR fuel assemblies in LOCA and seismic conditions, 11:29770 (R;FR)
Taking qualification requirements into account at the different levels of engineering. Nuclear qualification of electrical equipments, 11:29799 (R;FR;In French)

Solar Energy Research Inst., Golden, CO (USA)
Design tools for passive solar applications, 11:29602 (R;US)
Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests, 11:29603 (R;US)
Silica gel sorption properties under adiabatic conditions, 11:29604 (R;US)

South African Chemical Inst., Johannesburg
Defect solid state '84. Programme and abstract booklet, 11:30159 (R;ZA)

South African Inst. of Physics, Faure
Defect solid state '84. Programme and abstract booklet, 11:30159 (R;ZA)

South Carolina Univ., Columbia (USA). Dept. of Geography
Feasibility study of wood stork foraging habitat mapping using landsat multispectral data, 11:30595 (R;US)
Vegetational stress detection in a southeastern swamp floodplain using remote sensing and in-situ spectral measurements, 11:30620 (R;US)

South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy
Nuclear structure studies far from the line of beta stability, 11:30930 (R;US)
Participation in the ARGUS experiment at the DORIS collider at DESY, Hamburg, Germany, 11:30823 (R;US)

South Dakota School of Mines and Technology, Rapid City (USA). Inst. for the Study of Mineral Deposits
Thermally induced chemical migration: a natural analog approach. [Technical progress report], 11:30759 (R;US)

Southwest Engineering Associates, El Paso, TX (USA)
Target hardness comparison to IAEA unyielding target, 11:30349 (R;US)

SRI International, Menlo Park, CA (USA)
Improved coal conversion in CO/water systems. Quarterly report No. 5, September 4, 1985-December 3, 1985, 11:29163 (R;US)

Stanford Linear Accelerator Center, Menlo Park, CA (USA)
AS^{3}: a search for single photon events at PEP, 11:30846 (R;US)
Centrifugal space-charge forces in SLC, 11:30414 (R;US)
Gluonium candidates from hadronic and $e^{+}e^{-}$ interactions, 11:30845 (R;US)
Rotor electrometer for fractional charge searches, 11:30499 (R;US)
String primer, 11:30887 (R;US)

Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.
Effect of energy feedback mechanisms on the oxidation rate of pulverized coal. Quarterly report, December 1, 1985-February 28, 1986, 11:29217 (R;US)

Stanford Univ., CA (USA). Systems Optimization Lab.
Constructive characterization of Q_0-matrices with nonnegative principal minors, 11:30961 (R;US)

Statens Energiverk, Stockholm (Sweden)
Accumulators for the system of power plants delivering heat and electricity, 11:29877 (R;SE;In Swedish)
Full-scale experiments at Maglarp. Final report, 11:29667 (R;SE;In Swedish)
Full-scale experiments at Maglarp. Sub-project: Loads and strains. Sub-report nr 2: Valuation of measurements during October and November 1983, 11:29665 (R;SE;In Swedish)
Gasification of sod peat in a fixed bed cocurrent gasifier, 11:29169 (R;SE)
Hydrotreatment studies of Swedish peat products. Progress report No. 3 (Final), 11:29168 (R;SE)
Laboratory studies of the kinetics at high temperature pyrolysis of shale. Final report, 11:29275 (R;SE;In Swedish)
Manufacturing of blades WTS 1200, 11:29666 (R;SE;In Swedish)
Mechanical dewatering of peat treated with chemicals. Final report, 11:29213 (R;SE;In Swedish)
MINO feasibility study. Concluding report, 11:29153 (R;SE)
Pilot study in producing briquettes from peat, 11:29212 (R;SE;In Swedish)
Program for measuring the air pollution from burning peat fuels, 11:29200 (R;SE;In Swedish)
Research project District Heating, 11:29918 (R;SE;In Swedish)
Resonance compensation of wind power plants with variable rotor speed, 11:29668 (R;SE;In Swedish)
Variation of bulk density in Swedish peat bogs, 11:29203 (R;SE;In Swedish)

Statens Raad foer Byggnadsforskning, Stockholm (Sweden)
Analysis of energy consumption in administrative buildings, 11:29991 (R;SE;In Swedish)
Secondary refrigerants for heat pump applications. Studies of thermodynamic properties and corrosion, 11:29990 (R;SE;In Swedish)
Stockholm project. Quality control of energy-efficient settlement, 11:29992 (R;SE;In Swedish)
Vertical recirculation-type evaporators. An investigation of heat transfer and refrigerant circulation, 11:29989 (R;SE;In Swedish)

State Univ. of New York, Buffalo (USA). Dept. of Geological Sciences
Heat flow and subsurface temperature distributions in central and western New York. Final report, 11:29617 (R;US)

State Univ. of New York, Stony Brook (USA). Dept. of Earth and Space Sciences
Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985, 11:30758 (R;US)
State Univ. of New York, Stony Brook (USA). Inst. for Theoretical Physics
Diffractive hard scattering and the SSC, 11:30848 (R;US)
Stirling Thermal Motors, Inc., Ann Arbor, MI (USA)
Experimental assessment of advanced Stirling component concepts, 11:30049 (R;US)
Stuttgart Univ. (Germany, F.R.). Abt. Reaktorsicherheit und Umwelt
Liquefied gases risk assessment. Part 1: LPG land transportation and storage safety. Part 2: Potential hazards of low-temperature LPG in contact with warmer liquids, e.g. water, 11:29243 (R;DE;In German)
Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme
Liquefied gases risk assessment. Part 1: LPG land transportation and storage safety. Part 2: Potential hazards of low-temperature LPG in contact with warmer liquids, e.g. water, 11:29243 (R;DE;In German)
Sussex Univ., Brighton (UK). Astronomy Centre
Non-static vacuum strings: exterior and interior solutions, 11:30767 (R;US)
Swedish Nuclear Fuel and Waste Management Co., Stockholm
Scientific basis for nuclear waste management IX, 11:29420 (B;US)
Sydkraft Research Foundation, Malmoe (Sweden)
Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
Atmospheric FBC and CFBC - the American approach, 11:29221 (R;SE)
Coal power plant in Japan, especially in EPDC's case with advanced combustion and cleaning technique, 11:29678 (R;SE)
Combined cycle process with integrated gasification VEW-Coal Conversion Process, 11:29679 (R;SE)
Cool water Integrated Coal Gasification Combined Cycle project: status and results, 11:29680 (R;SE)
Experience from wet/dry desulfurization in Sweden, 11:29197 (R;SE)
Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
Gasification - general overview, 11:29166 (R;SE)
Modern pulverized coal combustion in Europe, 11:29220 (R;SE)
Pressurized-fluidized bed combustion (PFBC) - coal power for the future, 11:29223 (R;SE)

T

Technische Hochschule Aachen (Germany, F.R.)
Solidification of enriched tritium from reprocessing, 11:29402 (R;DE;In German)
Technische Hochschule Aachen (Germany, F.R.). Lehrstuhl und Inst. fuer Stromrichtertechnik und Elektrische Antriebe
Investigations of three-phase current drives for electric battery cars. Vol. 1. Fundamental principles, system studies and results of experimental studies, 11:30062 (R;DE;In German)
Investigations of three-phase current drives for electric battery cars. Vol. 2. Simulation; theory and results, 11:30063 (R;DE;In German)
Technische Univ. Braunschweig (Germany, F.R.). Inst. fuer Grundbau und Bodenmechanik
Depositions of environmental pollutants, 11:30023 (R;DE;In German)
Technische Univ. Muenchen, Garching (Germany, F.R.). Physikdepartment
Muon catalyzed fusion, 11:31077 (R;US)
Televerket, Farsta (Sweden)
Measurements of TV-interference from the wind power plant at Maglarp, 11:29644 (R;SE;In Swedish)
Tennessee Univ., Knoxville (USA)
Magnetic susceptibility of CfN, CfAs, and CfSb, 11:30190 (R;US)
Tennessee Univ., Knoxville (USA). Dept. of Physics
Production and destruction of metastable negative ions. Progress report, September 1, 1985-August 31, 1986, 11:30813 (R;US)
Tennessee Valley Authority, Chattanooga (USA)
Costs of reservoir releases aeration, 11:29495 (R;US)
Tennessee Valley Authority, Chattanooga (USA). Div. of Air and Water Resources
Costs of reservoir releases aeration, 11:29495 (R;US)
Tennessee Valley Authority, Chattanooga (USA). Div. of Fossil and Hydro Power
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
Tennessee Valley Authority, Knoxville (USA). Office of Natural Resources and Economic Development
Floods on North Toe River and Beaver, Grassy, and East Fork Grassy Creeks in the vicinity of Spruce Pine, North Carolina, 11:30743 (R;US)
Tennessee Valley Authority, Muscle Shoals, AL (USA)
National Fertilizer Development Center progress 84, 11:30686 (R;US)
Tennessee Valley Authority, Muscle Shoals, AL (USA). Div. of Technology Development
Distribution maps - national fertilizer programs; agricultural programs in the seven Tennessee Valley states; Tennessee Valley region: major land uses, livestock inventories, farm products, 11:30689 (R;US)
Tennessee Valley Authority, Muscle Shoals, AL (USA). Office of Agricultural and Chemical Development
New developments in fertilizer technology, 11:30688 (R;US)
Test-demonstration in northern New Mexico. Progress report, 11:30687 (R;US)
Texas A and M Univ., College Station (USA). Dept. of Oceanography
Geotechnical properties of fine-grained turbidite sequences: observations from the Nares Abyssal Plain, 11:30750 (R;US)
Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study
Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions, 11:30906 (R;JP)
Experiments using beams of unstable nuclear isotopes. Interaction cross sections and the radii of He isotopes, 11:30894 (R;JP)
Mass hierarchies of quarks and leptons in a supersymmetric SP(2N) subcolor theory, 11:30864 (R;JP)
Measurements of interaction cross sections and radii of He isotopes, 11:30895 (R;JP)
Nuclear collision theory with many-body correlations, 1. Formulation, 11:30933 (R;JP)
Nuclear collision theory with many-body correlations, 2. Deuteron+deuteron elastic scattering, 11:30893 (R;JP)
Reflection of the classical age in the intermediate energy physics, 11:30934 (R;JP)
Unified theory of nuclear physics, 11:30935 (R;JP)
Toulouse-3 Univ., 31 (France)
Variations of dose distribution in high energy electron beams as a function of geometrical parameters of irradiation. Application to computer calculation, 11:30664 (R;FR;In French)
TPI, Inc., Bethesda, MD (USA)
Solar Heat Technologies international program coordination support. Final report, 11:29565 (R;US)
TRIUMF, Vancouver, British Columbia (Canada)
Review of optically pumped polarized ion sources, 11:30418 (R;CA)
Status of the optically pumped polarized H^- ion source at TRIUMF, 11:30416 (R;CA)
TRIUMF polarized deuteron target NMR system, 11:30417 (R;CA)
TRW, Inc., Redondo Beach, CA (USA)
Design, performance investigation and delivery of a miniaturized Cassegrainian concentrator solar array. Final technical report, 11:29515 (R;US)
Tufts Univ., Medford, MA (USA)
K-meson production by nu/sub μ/-deuterium reactions near threshold: implications for nucleon-decay searches, 11:30824 (R;US)
Turin Univ. (Italy)
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
Tuskegee Inst., AL (USA). Dept. of Chemical Engineering
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)

U

UKAEA Atomic Energy Establishment, Winfrith
HECTOR measurements on plutonium-uranium metal fuel, 11:29815 (R;GB)
Versatile computer based system for data acquisition manipulation and presentation, 11:31275 (R;GB)
UKAEA Atomic Energy Establishment, Winfrith. Control and Instrumentation Div.
Review of NRTMA statistical tests, 11:29451 (R;GB)
UKAEA Atomic Energy Establishment, Winfrith. General Reactor Physics Div.
Reactivity change measurements on plutonium uranium oxide fuel clusters in a plutonium uranium metal lattice in HECTOR, 11:29814 (R;GB)
UKAEA Atomic Energy Research Establishment, Harwell
Acid-split flowsheets for uranium-plutonium partitioning without a reductant, 11:29293 (R;US)
UKAEA Atomic Energy Research Establishment, Harwell. Energy Technology Div.
Active solar heating in the UK. Department of Energy R and D programme 1977-1984, 11:29566 (R;GB)
Prospects for the exploitation of the renewable energy technologies in the United Kingdom, 11:29916 (R;GB)
R and D needs in wind energy, 11:29651 (R;GB)
Wave energy. The Department of Energy's R and D programme 1974-1983, 11:29643 (R;GB)
UKAEA Atomic Energy Research Establishment, Harwell. Materials Physics and Metallurgy Div.
Harwell version of the DLC37F nuclear data library, 11:30889 (R;GB)
UKAEA Culham Lab., Abingdon
Liquid metal field emission thrusters and ion sources: a review. Final report, 11:30032 (R;GB)
UKAEA Safety and Reliability Directorate, Culcheth
Factors influencing pool fires on porous ground, 11:30544 (R;GB)
Literature review of fire modelling techniques and related subjects, 11:29865 (R;GB)
Thermal radiation hazard ranges from large hydrocarbon pool fires, 11:30563 (R;GB)
Umweltbundesamt, Berlin (Germany, F.R.)
Federal Environmental Office annual report 1984, 11:29906 (R;DE;In German)
Universidad Autonoma de Madrid (Spain). Facultad de Ciencias Fisicas
Inclusive production of strange particles in 360 GeV/c PP interactions, 11:30825 (R;ES;In Spanish)
University Coll., London (UK)
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
USDOE Bonneville Power Administration, Portland, OR. Div. of Fish and Wildlife
Study to determine the biological feasibility of a new fish tagging system. Annual report 1984, 11:30685 (R;US)
USDOE Bonneville Power Administration, Portland, OR. Office of Conservation
Preliminary radon testing results for the Residential Standards Demonstration Program. Program results No. 3, 11:29905 (R;US)
USDOE Energy Information Administration, Washington, DC. Office of Coal, Nuclear, Electric and Alternate Fuels
Annual outlook for US coal 1986, with projections to 1995, 11:29226 (R;US)
Annual outlook for US electric power, 1986, 11:29945 (R;US)
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)
USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas
Costs and indices for domestic oil and gas field equipment and production operations, 1985, 11:29245 (R;US)
Petroleum marketing monthly, February 1986, 11:29246 (R;US)
USDOE Idaho Operations Office, Idaho Falls
Radiation exposure rates and radionuclide concentrations in soil around the Argonne National Laboratory-West Site, 11:30581 (R;US)
USDOE Morgantown Energy Technology Center, WV
Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures, 11:29158 (R;US)
USDOE Office of Energy Research, Washington, DC
Programs of the Office of Energy Research, 11:30762 (R;US)
USDOE Office of Energy Research, Washington, DC. Development and Technology Div.
Eighth annual progress report on special purpose materials for magnetically confined fusion reactors, 11:31067 (R;US)
Utah Univ., Salt Lake City (USA). Dept. of Fuels Engineering
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
Utah Univ., Salt Lake City (USA). Dept. of Metallurgy
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)

V

Valtion Teknillinen Tutkimuskeskus, Espoo (Finland)
Utilization of chipwood in Lapland. Prehandling, 11:29491 (R;FI;In Finnish)
Wood fuels properties and principles of pricing, 11:29490 (R;FI;In Finnish)
Verein Deutscher Ingenieure (VDI) - Kommission Reinhaltung der Luft, Duesseldorf (Germany, F.R.)
State of forest decline in the Federal Republic of Germany. Vol. 1, 11:30704 (R;DE;In German)
Vienna Univ. (Austria). Inst. fuer Theoretische Physik
Proton decay: theory versus experiment, 11:30877 (R;AT)
Spin-3/2 fields on black hole spacetimes, 11:30807 (R;AT)
Stability of matter, 11:30806 (R;AT;In German)
SVZ, gluon condensate and potential models, 11:30876 (R;AT)
Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985, 11:29183 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1984-April 30, 1985, 11:30855 (R;US)
Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Chemistry
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics
Partial wave analyses of hadron scattering below 2 GeV. Progress report, May 1, 1985-April 30, 1986, 11:30856 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1980-April 30, 1981, 11:30852 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1982-April 30, 1983, 11:30853 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1983-April 30, 1984, 11:30854 (R;US)
Partial wave analysis of π-N, NN, and KN scattering below 2 GeV. Progress report, June 1, 1979-May 31, 1980, 11:30851 (R;US)
Virginia Univ., Charlottesville (USA)
Research in computer science. semiannual report, 11:31283 (R;US)
Virginia Univ., Charlottesville (USA). Beams Physics Lab.
Tests of T-invariance with slow neutrons, 11:30947 (R;US)
Virginia Univ., Charlottesville (USA). Dept. of Physics
Magnetic impurities in superconductors. Performance report, July 1, 1985-June 30, 1986, 11:30337 (R;US)
Studies of autoionizing states relevant to dielectronic recombination. Progress report, July 1, 1985-June 30, 1986, 11:30812 (R;US)
Vrije Univ., Brussels (Belgium)
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)

W

Washington State Energy Office, Olympia (USA)
Washington State Solar Bank Program. A comprehensive 1984-85 program evaluation, 11:29605 (R;US)
Washington State Solar Bank Program. Special report: interim evaluation of the solar bank program, 11:29606 (R;US)

Washington Univ., Seattle (USA). Dept. of Zoology
Control of productivity and population characteristics in aquatic communities. Progress report, 1 September 1982-31 August 1983, 11:30594 (R;US)

Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.
Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses, 11:29215 (R;US)
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems, 11:29216 (R;US)

Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering
US/JAERI calculational benchmarks for nuclear data and codes intercomparison. Article 8, 11:31032 (R;US)

Wisconsin Univ., Madison (USA). Fusion Technology Inst.
Estimates of maximum trappable ion beam power in plasma channels, 11:30982 (R;US)

Woods Hole Oceanographic Institution, MA (USA)
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)

Wright State Univ., Dayton, OH (USA)
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)

Wyoming Univ., Laramie (USA). Office of Univ. Research
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)

X

Xerox Palo Alto Research Center, CA (USA)
Detection of charged particles in amorphous silicon layers, 11:30425 (R;US)

Y

Yale Univ., New Haven, CT (USA). Dept. of Chemistry
Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985, 11:29177 (R;US)

PERSONAL AUTHOR INDEX

Authors' surnames are indexed in the form appearing in the abstracted publication; given names are reduced to initials. Each author entry gives the publication title and the citation number. The document type, e.g., R for Report; country of publication, e.g., US; and language of the document, e.g., In German; are given in parentheses at the end of the entry. If no language statement appears, the language is English. Tables of document types and country of publication codes appear after the indexes. For publications with multiple authors, an entry is provided for each author. Entries for the second and succeeding authors give references to the first author.

Because of problems involved in the mechanical preparation of this index, all accent marks are omitted. Changes in spelling introduced as a result of accent omission follow standard conventions.

A

Aa, P.J., New life for old weighted wire precipitators: rebuilding with rigid electrodes, 11:29709 (RA;US)

Aalto, A., System development of availability statistics on thermal power plants, 11:29675 (R;FI;In Finnish)

Abbott, L., Pressurized thermal shock evaluation of the Calvert Cliffs Unit 1 Nuclear Power Plant, 11:29774 (R;US)

Abdel Dayem, A.M., *See* El Halwagi, M.M., 11:29470

Abdel-Khalik, S.I., *See* Sviatoslavsky, I.N., 11:31151

Abdou, M., *See* Gierszewski, P., 11:31158
See Tilack, M., 11:31245
See Youssef, M., 11:31033

Abdou, M.A., Deuterium-tritium fuel self-sufficiency in fusion reactors, 11:31086 (J;US)
See Oyama, Y., 11:31243
See Youssef, M.Z., 11:31087

Abeele, W., *See* Nyhan, J.W., 11:29404

Abeele, W.V., Subsidence and settlement and their effect on shallow land burial, 11:29326 (RA;US)
See Nyhan, J.W., 11:30618

Abel, E., New electricity-using technologies in Swedish buildings, 11:29975 (RA;US)

Abolins, J.A., Infrared maps of M81: an example of the IRAS Close Galaxy Programme, 11:30798 (RA;GB)

Abou-Elfotouh, F., Photoluminescence studies of CuIn-Se_2 thin films and crystals, 11:29552 (BA;US)

Abraha, S., Development of biogas technology in Ethiopia, 11:29471 (RA;DE)

Abraham, M.M., Method for the preparation of photochromic insulating crystals, 11:30171 (P;US)

Abrahamson, S., Genetic effects, 11:29449 (RA;US)

Abu-Abdou, K., Flow in the circulation loop of a thermosyphon solar water heating system, 11:29569 (RA;US)

Accary, A., Corrosion behaviour of container materials for geological disposal of high level radioactive waste, 11:30092 (R;FR)

Accetta, F.S., Finite temperature instability for compactification, 11:30763 (R;US)
Stable compactifications, 11:30880 (R;US)

Achhireddy, N.R., Influence of shade on the growth and nitrogen assimilation of developing fruits on bell pepper, 11:30656 (J;US)
Studies on the nitrate reductase activities of the fruit and the source leaf in pepper, 11:30641 (J;US)

Ackerman, D.J., *See* Tuttle, M.L., 11:29287

Adam, G.K., *See* Fewell, M.P., 11:30910

Adams, J.P., Influence of LOFT PWR transient simulations on thermal-hydraulic aspects of commercial PWR safety, 11:29869 (J;US)

Adams, J.W., *See* Piciulo, P.L., 11:29433

Adams, M.C., Development and application of tracers: examples of field and experimental studies, 11:29620 (RA;US)

Adduci, A.J., SAN overview/discussion of heat cycle research, 11:29982 (RA;US)

Ade, P.A.R., *See* Chase, S.T., 11:30802

Adomeit, G., Experimental investigation of the acceleration of deflagration in wake flow, 11:30323 (R;FR)

Aganagic, M., Constructive characterization of Q_0-matrices with nonnegative principal minors, 11:30961 (R;US)

Agarwal, R.S., *See* Gadhi, S.M.B., 11:29595

Aggson, J.R., *See* Kim, K., 11:29415

Agnew, S.F., *See* Swanson, B.I., 11:30253

Agrell, M., Full-scale experiments at Maglarp. Final report, 11:29667 (R;SE;In Swedish)

Ahlers, R., Electrical control of a cogeneration set in parallel mains operation or in stand-by operation, 11:29480 (RA;DE)

Ahluwalia, R.K., Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)

Ahmad, M., Roton-like excitation in superfluid helium-4, 11:30820 (R;XA)

Ahmed, H.G., *See* Hussein, A.Z., 11:30507

Ahponen, V., *See* Ollila, H., 11:30025

Aichelburg, P.C., Spin-3/2 fields on black hole spacetimes, 11:30807 (R;AT)

Aihara, H., *See* Itoh, R., 11:30453

Aiken, C.L.V., *See* Hinze, W.J., 11:29622

Akerlund, C.E., Static field strength in wire-plate electrostatic precipitators with profiled collecting electrodes by an experimental method, 11:29726 (RA;US)

Akiyama, Masatsugu, *See* Katakura, Junichi, 11:30913

Akporiaye, E.T., *See* Walker, E.B., 11:30646

Aksay, I.A., *See* Halverson, D.C., 11:30132

Aksugur, E., *See* Bajwa, M.M., 11:29574

Akyurt, M., *See* Khalifa, A.M.A., 11:29591

Al-Otaibi, G.S., *See* Bajwa, M.M., 11:29574

Alaghband, G., Multiprocessor sparse L/U decomposition with controlled fill-in. Final report, 11:31280 (R;US)

Alajajian, S.H., *See* Chutjian, A., 11:30818

Alamaeki, *See* Korpela, T., 11:30029

Alamo, A., Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30072 (R;FR;In French)
Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30076 (R;FR;In French)

Alber, G., Battery monitoring and integrity testing of large lead-acid storage batteries, 11:29895 (RA;US)

Albrecht, G.F., *See* Crawford, E.A., 11:30371

Alden, R.G., *See* Swanson, B.I., 11:30253

Aldred, A.T., Partial structure-field map for $A^{3+}B^{6+}O_4$ compounds, 11:30135 (J;NL)
See Nevitt, M.V., 11:30138

Alexander, C.W., *See* Bigelow, J.E., 11:30308
See Knauer, J.B., 11:30336

Alfredson, P.G., Review of oil shale research in Australia, 11:29939 (BA;US)

Alger, T. W., *See* Benett, W. J., 11:30368

Alkezweeny, A.J., Aircraft and ground measurements of ammonia in Kentucky, 11:30547 (J;GB)

Allan, G., *See* Ritchie, J., 11:29353

Allan, R., *See* Krigmont, H., 11:29707

Allen, A.M.T., Defects in solids studied by optical techniques, 11:30158 (RA;ZA)

Allen, C.R., Full scale tests on remote handled FFTF fuel assembly waste handling and packaging, 11:30340 (R;US)

Allen, G.C., Development of a large unyielding target for packaging tests, 11:30348 (R;US)

Allen, J.J., Verification study of SHELL SHOCK, 11:31285 (R;US)

Allen, M.D., Slip correction measurements for aerosol particles of doublet and

triangular triplet aggregates of spheres, 11:30821 (RA;US)
Allen, R.P., *See* Schneider, K.J., 11:29412
Allen, S.L., *See* Turner, W.C., 11:31259
Almqvist, P., Pressurized-fluidized bed combustion (PFBC) - coal power for the future, 11:29223 (R;SE)
Alper, B., Active solar heating in the UK. Department of Energy R and D programme 1977-1984, 11:29566 (R;GB)
Alpert, S.B., Cool water Integrated Coal Gasification Combined Cycle project: status and results, 11:29680 (R;SE)
Alsmiller, F.S., *See* Alsmiller, R.G. Jr., 11:30946
Alsmiller, R.G. Jr., Nucleon-meson cascade calculations by Monte Carlo methods, 11:30946 (R;US)
Altes, J., *See* Breitbach, G., 11:30380
Althaus, D., Polar measurements on profiles, 11:29654 (RA;DE;In German)
Altin, C.A., Critical electrostatic precipitator purchasing concepts, 11:29738 (RA;US)
See Szabo, M.F., 11:29735
Altman, R.F., Technical evaluation of plate spacing effects on fly ash collection in precipitators, 11:29717 (RA;US)
See Altin, C.A., 11:29738
See Bickelhaupt, R.E., 11:29722
See Dahlin, R.S., 11:29701
See Dismukes, E.B., 11:29703
See DuBard, J.L., 11:29697
Altmejd, M., Use of computer network to achieve testing flexibility, 11:29896 (RA;US)
Alvarez, L.W., *See* Alvarez, W., 11:30573
Alvarez, W., Impact theory of mass extinctions and the invertebrate fossil record, 11:30573 (J;US)
Ambrose, K.R., *See* Goodman, M.M., 11:30661
Ammar, R., *See* Mann, W.A., 11:30824
Anderman, M., Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Andersen, R.A., *See* Brennan, J.G., 11:30317
See Edwards, P.G., 11:30273
Andersen, S.I., *See* Larsen, G.C., 11:30510
Anderson, A.L., *See* Griffith, R.V., 11:30951
Anderson, C.A., Investigation of the strength of H440 graphite when subjected to combined primary and secondary stress, 11:30162 (R;US)
Anderson, D., *See* Majewski, S., 11:30495
Anderson, D.F., *See* Caffrey, A.J., 11:30472
Anderson, J.L., *See* Garvey, D.B., 11:29214
Anderson, J.W.D., *See* Ardron, K.H., 11:29776
Anderson, L.E., Biological effects of electric fields: an overview, 11:30732 (BA;US)
Anderson, M.B., Development in aerodynamic calculation methods, 11:29655 (RA;DE)
Anderson, R.E., *See* Garcia, R., 11:29390
Anderson, T.C., *See* Funk, V.T., 11:29245
Anderson, W.A., Influence of design variables on radiation hardness of silicon MINP solar cells, 11:29531 (RA;US)
See Banerjee, S., 11:29530
Anderson, W.E., Some novel concepts in fracture mechanics, 11:30359 (J;IN)
Andersson, L.A., *See* Holst, L., 11:29275
Anderton, M.F., Critical evaluation of anaerobic fermentation of waste products 'a management study', 11:29484 (R;FR)
Andre, M., *See* Finkel, B., 11:31276
Andrews, W.B., *See* Mullen, M.F., 11:29753
Angelini, P., Secondary fluorescence effects on x-ray microanalysis, 11:30141 (J;US)
Anhalt, J., Pyranometer comparison at INPE, Atibaia, in August 1983, 11:30497 (R;BR)
Ansari, A., *See* Wuest, E., 11:30918
Antepenko, R.J., *See* Merrill, R.M., 11:30164
Aoki, S., *See* Sato, T., 11:30036
Aoyagi, K., Pyruvate, Pi dikinase in bundle sheath strands as well as in mesophyll cells in maize leaves, 11:30669 (J;US)
Synthesis and uptake of cytoplasmically synthesized pyruvate, Pi dikinase polypeptide by chloroplasts, 11:30629 (J;US)
App, B.Sc., *See* Chong, Y., 11:29270
Apsimon, R.J., The recent operational performance of the CERN Omega Ring Imaging Cerenkov Detector, 11:30450 (J;US)
Arafune, J., Proceedings of the workshop on 'monopoles and proton decay', 11:30822 (R;JP)
Arafune, Jiro, Some topics in cosmic rays, 11:30780 (RA;JP)
Arai, Masaru, Equation of state for fuel and target implosion, 11:31071 (RA;JP)
Arakawa, E.T., *See* Bloemer, M.J., 11:30393
See Little, J.W., 11:30115
Aramayo, G.A., *See* Llewellyn, G.H., 11:30106
Arasteh, D., Detailed thermal performance data on conventional and highly insulating window systems, 11:30003 (R;US)
Arcieri, W.C., *See* Park, Y.M., 11:29301
Ardron, K.H., Two-phase natural circulation experiments in a pressurized water loop with CANDU geometry, 11:29776 (R;CA)
Arendt, P.N., *See* Scott, M.L., 11:30341
Argon, A.S., Mechanics and mechanisms of intergranular cavitation in creeping alloys, 11:30118 (BA;NL)
Armstrong, D.W., Synthesis, rapid resolution, and determination of absolute configuration of racemic 2,2'-binaphthyldiyl crown ethers and analogues via β-cyclodextrin complexation, 11:30260 (J;US)
Armstrong, J., *See* Durham, M., 11:29711
See Rugg, D.E., 11:29686
Armstrong, W.T., *See* Rej, D.J., 11:31263
See Siemon, R.E., 11:31264
Arndt, R.A., Partial wave analysis of π-N, NN, and KN scattering below 2 GeV. Progress report, June 1, 1979-May 31, 1980, 11:30851 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1980-April 30, 1981, 11:30852 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1982-April 30, 1983, 11:30853 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1983-April 30, 1984, 11:30854 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1984-April 30, 1985, 11:30855 (R;US)
Partial wave analyses of hadron scattering below 2 GeV. Progress report, May 1, 1985-April 30, 1986, 11:30856 (R;US)
Arntzen, C.J., *See* McCourt, P., 11:30630
Aronsson, R., Analysis of energy consumption in administrative buildings, 11:29991 (R;SE;In Swedish)
Arpasi, D.J., *See* Milner, E.J., 11:30035
Arunasalan, V., *See* Murakami, M., 11:30995
Arutiunov, V.S., Mechanism of thermal decomposition of krypton difluoride, 11:30233 (TJ;US)
Arvizu, D.E., Photovoltaic concentrator research status, 11:29611 (BA;US)
Asaro, F., *See* Alvarez, W., 11:30573
Ascarelli, G., Calculation of the mobility of electrons injected in liquid argon, 11:30168 (J;US)
Asghar, M., *See* Haddad, M., 11:30925
See Sicre, A., 11:30927
Ashby, D.E.T.F., *See* Sheffield, J., 11:31085
Ashford, V., Development of the Cerenkov Ring Imaging Detector for the SLD, 11:30449 (J;US)
See Bird, F., 11:30478
Ashgar, M., Quasi-particle excitations in low energy fission, 11:30924 (R;FR)
Ashwill, T.D., *See* Lobitz, D.W., 11:29664
Ashwood, T.L., *See* Rhyne, W.R., 11:29298
Assmann, S.M., Stomatal responses to CO_2 in Paphiopedilum and Phragmipedium: role of the guard cell chloroplast, 11:30681 (J;US)
See Zeiger, E., 11:30680
Aster, R.W., *See* Crosetti, M.R., 11:29559
Aston, M., *See* Chapman, P., 11:30067
Atac, M., Radial wire drift chambers for CDF forward tracking, 11:30454 (J;US)
Atencio, L.G., New focal plane detector for the magnet spectrometer Big Karl, 11:30480 (J;NL)
Atkins, A.R., *See* Stephenson, L., 11:29273
Attalla, A., The determination of deuterium and tritium in effluent wastewater by pulsed nuclear magnetic resonance spectroscopy, 11:31101 (J;US)
Atwood, W.B., *See* Hodges, C., 11:30452
See Young, C.C., 11:30476
Aubert, H., *See* Alamo, A., 11:30072, 11:30076
Auerbach, S.I., *See* Dahlman, R.C., 11:30701
Augustin, J.E., DM2 results on hadronic and radiactive J/psi decays, 11:30837 (R;FR)
Selected results on J/psi hadronic decays from DM2 and Mark III, 11:30840 (R;FR)
Augustin, X., *See* de Buzonniere, A., 11:29343

Ault, G.M., Modification of an existing radwaste facility to provide onsite low level waste storage, 11:29368 (RA;US)
Aust, K.D., Data acquisition and control instrumentation of the BEWAG battery test facility, 11:29894 (RA;US)
Avignone, F.T. III, Nuclear structure studies far from the line of beta stability, 11:30930 (R;US)
Avni, R., *See* Manory, R.R., 11:30123
Awai, A., *See* Bradley, F.J., 11:29408
Axelrod, M.C., *See* Kercher, J.R., 11:30728
Azaiez, F., Gamma-decay of the 1gsub(9/2) and 2p inner-hole states in ^{111}Sn via the ^{113}Sn(^{3}He) reaction at 32 MeV, 11:30911 (R;FR)

B

Baader, W., Experiences on handling liquid substrates of high solid content in agricultural biogas-plants, 11:29481 (RA;DE)
Baaklini, G.Y., *See* Roth, D.J., 11:30122
Babcock, G.T., *See* Boska, M., 11:30643
Babich, J., *See* Leblanc, A., 11:30310
Bachas, C., String primer, 11:30887 (R;US)
Bacheller, D., Excitation of the Δ resonance in relativistic heavy ion charge exchange reactions, 11:30905 (RA;US)
Bacon, F. M., Single-ring magnetic cusp low gas pressure ion source, 11:30668 (P;US)
Badalamente, R.V., Recommendations to the NRC on human engineering guidelines for nuclear power plant maintainability, 11:29852 (R;US)
See Triggs, T.J., 11:29792
Badre, A., Contribution to the study of radioactive and heavy jets discharged in the presence of a cross-stream, 11:30560 (R;FR;In French)
Baer, H.W., Can we learn about the spin flip giant dipole resonances with pions?, 11:30940 (BA;US)
Baer, S., *See* McMahon, J.J., 11:30282
Bair, R.A., *See* Dunning, T.H. Jr., 11:30206
Baird, W., A solid state directional gamma detector, 11:30433 (J;US)
High range gamma radiation meter, 11:30434 (J;US)
Baity, F.W., ICRF heating technology development activities at Oak Ridge National Laboratory, 11:31026 (R;US)
See Hoffman, D.J., 11:31028, 11:31191, 11:31193
See Owens, T.L., 11:31192
See Whealton, J.H., 11:31199
Bajwa, M.M., Passive solar cooling house at King Faisal University, 11:29574 (RA;US)
Bak, P., Crystallography of icosahedral crystals, 11:30952 (R;US)
Bakac, A., Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex, 11:30246 (J;US)
Mechanistic investigation of carbon-carbon bond formation in the reduction of alkyl halides by organonickel complexes in aqueous solution, 11:30247 (J;US)
Baker, C.C., New directions in Tokamak reactors, 11:31121 (J;US)
Baker, D.A., *See* Massey, R.S., 11:31177
Baker, D.N., Hostile energetic particle radiation environments in earth's outer magnetosphere, 11:30809 (R;US)
Baker, L.J., Harwell version of the DLC37F nuclear data library, 11:30889 (R;GB)
Balcomb, J.D., Design tools for passive solar applications, 11:29602 (R;US)
Baldwin, D.E., *See* Thomassen, K.I., 11:31261
Baldwin, R.M., Pyrolysis of oil shale in supercritical toluene reaction mechanism and role of hydrogen, 11:29271 (BA;US)
Ball, J.R., Handbook for quick cost estimates. A method for developing quick approximate estimates of costs for generic actions for nuclear power plants, 11:29788 (R;US)
Balooch, M., Reactions of chlorine with liquid metals. 3. Bismuth, 11:30199 (J;US)
Thermal and ion-assisted reactions of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine, 11:30161 (R;US)
Bandini, B.R., *See* Lee, J.D., 11:31133
Banerjee, S., I-V-T analysis of radiation damage in high efficiency Si solar cells, 11:29530 (RA;US)
See Anderson, W.A., 11:29531
Bannerman, R.C., *See* Richmond, R., 11:29815
Bantel, M., *See* Schmidt, H.R., 11:30482
Baratakanwa, V., *See* Niyimbona, P., 11:29465
Barate, R., Heavy flavour photoproduction and decay, 11:30850 (R;US)
Barbry, F., Research program and uses of the solution fueled reactor SILENE, 11:29816 (R;FR;In French)
Barcalow, J.C., Mobile solidification system interface design considerations, 11:29369 (RA;US)
Barclay, J.A., Experiment to determine properties of packed particle beds and regenerators at cryogenic temperatures, 11:30360 (J;US)
Barclay, K.M., *See* Gay, R.L., 11:30189
Barde, H., Telecom 1 power subsystem from design to flight, 11:29508 (RA;FR)
Bardsley, D.J., Versatile computer based system for data acquisition manipulation and presentation, 11:31275 (R;GB)
Barger, V., How to search for new particles at anti pp colliders, 11:30847 (BA;US)
Barklow, T., SLAC Scanner Processor applications in the data acquisition system for the upgraded MARK II detector, 11:30462 (J;US)
Barnaby, C.S., *See* Wilcox, B.A., 11:29568
Barnes, P.D., Nonleptonic weak interactions in hypernuclei, 11:30896 (R;US)
Barnett, A.M., *See* Desalvo, G.C., 11:29520
See McNeely, J.B., 11:29523
Barnham, A.K., *See* Taylor, R.W., 11:29282
Barnthouse, L.W., Ecological risk analysis: prospects and problems, 11:30601 (RA;US)
Barr, W.L., A new concept for pumping the edge plasma, 11:31237 (J;US)
See Henning, C.D., 11:31123
Barreau, G., *See* Sicre, A., 11:30927
Barreto, J., *See* Barros, S. de, 11:30928
Barrett, L.H., *See* Reilly, J.K., 11:29831
Barrett, R.J., Hot cell facility design for large fusion devices, 11:31232 (J;US)
See Reid, R.L., 11:31117
Barron, M.H., *See* Gutschick, V.P., 11:30505
Barros, S. de, Excitation function and half-life for the fission isomer sup(240m) Pu from the ^{238}U(α, 2n) sup(240m) Pu reaction, 11:30928 (R;BR)
Barsotti, E.J., *See* Walz, H.V., 11:30435
Bartch, R.A., *See* Armstrong, D.W., 11:30260
Barter, J., *See* Molvik, A.W., 11:30985
Bartsch, R.R., *See* Rej, D.J., 11:31263
See Siemon, R.E., 11:31264
Basden, L.S., Characterization of fugitive particulate emissions from industrial sites, 11:30530 (RA;US)
Bass, J.W., Atmospheric FBC and CFBC - the American approach, 11:29221 (R;SE)
Bass, S.J., Regulatory framework for hazardous mixed wastes, 11:29328 (RA;US)
Bassham, J.A., *See* Aoyagi, K., 11:30629
See Baysdorfer, C., 11:30698
Basso, M., Passive solar design for a high rise housing building in a seismic zone: design development and calculated performance, 11:29594 (RA;US)
Batarseh, S., *See* Tanni, R., 11:29599
Batchelor, D.B., *See* Rasmussen, D.A., 11:31022
Batchelor, K., Microwave undulator, 11:30415 (R;US)
Bateman, V.I., Methods for verifying strain gage installations, 11:30345 (R;US)
Bates, E., *See* Taback, H., 11:29280
Bates, E.R., EPA oil shale research activities, 11:29255 (BA;US)
Bates, L.D., Development of the Central Waste Disposal Facility, 11:29341 (RA;US)
Bates, L.J., *See* Marchant, D.D., 11:29983
Bathke, C.G., A comparison study of toroidal-field divertors for a Compact Reversed-Field Pinch Reactor, 11:31176 (J;US)
Batley, R., Highly segmented NaI(Tl) detector with vacuum photodiode readout for measuring electromagnetic showers at the CERN ISR, 11:30485 (J;NL)
Batt, D.L., *See* Adams, J.P., 11:29869
Battacharyya, S.N., Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study, 11:30296 (J;GB)
Battak, M.E., *See* Copenhaver, C., 11:31175
Battat, M.E., *See* Davidson, J.W., 11:31174
Battle, R.E., Description of a research reactor control system using a

programmable controller, 11:29817 (R;US)
See Stone, R.S., 11:29854
Battles, J.E., Post-test analyses of Na/S cells and aqueous batteries, 11:29898 (RA;US)
Batts, B.D., *See* Stephenson, L., 11:29273
Batzer, T.H., Liquid to gas leak ratios with liquid nitrogen and liquid helium, 11:31190 (J;US)
Bauche-Arnoult, C., *See* Wyart, J.F., 11:30966
Baudisch, H., DAW volume reduction (VR) using the newly developed 20 MN (2200 tons) SUPERPACK: a new generation of supercompactor equipment, 11:29382 (RA;US)
Bauer, J.F., *See* Sager, G.T., 11:31003
Bauer, R.W., *See* Wong, C., 11:31154
Baughman, R. J., Method for production of free standing polycrystalline boron phosphide film, 11:30172 (P;US)
Baum, J.W., Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)
Bauman, T., *See* Carson, C.C., 11:29623
Baumbaugh, A.E., A real time data compactor (sparsifier) and 8 megabyte high speed FIFO for HEP, 11:30469 (J;US)
Baumbaugh, B., *See* Ruchti, R., 11:30474
Baur, J.F., *See* Thomas, D.M., 11:31014
Baxter, A.M., *See* Fewell, M.P., 11:30919
Baysdorfer, C., Photosynthate supply and utilization in alfalfa: a developmental shift from a source to a sink limitation of photosynthesis, 11:30698 (J;US)
Beahm, E.C., Tellurium behavior in containment under light water reactor accident conditions, 11:29856 (R;US)
Beall, J.M., *See* Levinson, S.J., 11:31018
Beals, D.I., *See* Sheppard, M.T., 11:29430
Beatty, R.N., Radwaste processing at the Advanced Test Reactor facility, 11:29811 (RA;US)
Beauchamp, P.K., *See* Baird, W., 11:30433
Becher, P.F., Subcritical crack growth in partially stabilized ZrO_2(MgO), 11:30125 (J;GB)
See Finch, C.B., 11:30140
Beck, H., *See* Weeds, J., 11:31206
Beck, R.N., Quantitative studies in radiopharmaceutical science. Progress report, January 1-December 31, 1985, 11:30663 (R;US)
Becraft, W.R., *See* Hoffman, D.J., 11:31191, 11:31193
See Schechter, D.E., 11:31233
See Whealton, J.H., 11:31199
Bedeschi, F., A silicon vertex detector for CDF, 11:30446 (J;US)
Beeston, J.M., *See* Miller, L.G., 11:31248
Beevers, L., *See* Achhireddy, N.R., 11:30641, 11:30656
Behrens, J.W., *See* Trochon, J., 11:30926
Belba, V., Economics of electrostatic precipitators and fabric filters, 11:29689 (RA;US)
Belba, V.H., Acid rain control options - impact on precipitator performance, 11:29734 (RA;US)
Belford, R.L., Electron spin mapping of coal molecular structure by ENDOR. Quarterly technical progress report, 11:29181 (R;US)
Belforte, S., *See* Bedeschi, F., 11:30446
Bellan, R.D., *See* Baker, D.N., 11:30809
Bell, G., *See* Cohn, D.R., 11:31173
See Gierszewski, P., 11:31158
Bell, J.D., *See* Murakami, M., 11:30995
Bell, M.A., *See* Whealton, J.H., 11:31010, 11:31199
Bell, M.G., *See* Brown, D.I., 11:31260
See Murakami, M., 11:30995
Bell, R., *See* Bernabei, S., 11:30990
Bellettini, G., *See* Bedeschi, F., 11:30446
Belliveau, J.F., *See* Sunderman, F.W. Jr., 11:30729
Bender, M., *See* Abrahamson, S., 11:29449
Bendieu, J.C., *See* Fuchs, F.W., 11:30063
Benett, W. J., Inductive gas line for pulsed lasers, 11:30368 (P;US)
Benfoughal, T., *See* Sicre, A., 11:30927
Bengtson, R.D., *See* Levinson, S.J., 11:31018
Benjamin, A.S., Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)
Benjamin, R., A photon-counting detector for doppler width ion temperature measurements, 11:31016 (BA;US)
Benker, D.E., Head-end and solvent extraction studies using fast-flux test facility fuel, 11:29292 (R;US)
Benner, J.P., Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)
Bennet, D. W., *See* Spicer, L. D., 11:30549
Bennett, E.F., Experimental techniques and measurement accuracies, 11:31157 (J;US)
Benninger, G.N., Advanced secondary battery development and testing: a Canadian perspective, 11:29880 (RA;US)
Bentley, J., *See* Angelini, P., 11:30141
Bentley, R.D., *See* Harrison, R.A., 11:30789
Berberian, G.A., *See* Segar, D.A., 11:30613
Berg, A.C.v.d., *See* Wingerden, G.J.M.v., 11:30508
Berg, G.P.A., *See* Atencio, L.G., 11:30480
Berge, K., Modern pulverized coal combustion in Europe, 11:29220 (R;SE)
Berger, E.L., Diffractive hard scattering and the SSC, 11:30848 (R;US)
QCD prediction for charmonium production in anti pp collisions, 11:30878 (BA;US)
Berger, J.D., Use of remote systems and automation in radioactive waste shipping and receiving, 11:29306 (R;US)
Use of robotics for radioactive waste shipping and receiving, 11:29307 (R;US)
Bergeron, G.L., *See* Park, S.Y., 11:31269
Bergmann, L., Hot-gas fabric filtration 500°F-1500°F - no Utopia but reality, 11:29695 (RA;US)
Bergshoeff, E., Critical dimensions for strings in a curved background, 11:30881 (R;IT)
Superconformal invariance and the tensor multiplet in six dimensions, 11:30882 (R;IT)
Bergstroem, J., Program for measuring the air pollution from burning peat fuels, 11:29200 (R;SE;In Swedish)
Berman, S. M., Magnetic fluorescent lamp having reduced ultraviolet self absorption, 11:30402 (P;US)
Bernabei, S., Top-versus-side launch of lower hybrid waves in PLT, 11:30990 (J;AT)
Bernido, C.C., On the hadron as a microuniverse, 11:30862 (R;XA)
Bernstein, D., dE/dx electronics for MARK II experiment at SLAC, 11:30445 (J;US)
Bernstein, J., Structure and spectral properties of a squarylium dye, 2,4-bis[(1-n-butyl-2(1H)-quinolylidene)methyl]-1,3-cyclobutadienediylium-1,3-diolate, 11:30241 (J;US)
Berset, J.C., *See* Batley, R., 11:30485
Berta, V.T., *See* Adams, J.P., 11:29869
Bertlmann, R.A., SVZ, gluon condensate and potential models, 11:30876 (R;AT)
Bertone, P.C., Measuring nanocurie quantities of tritium bred in metallic lithium and lithium oxide samples, 11:31204 (J;US)
Berty, T.E., *See* Miller, W.R., 11:29154
Bervillier, C., About the obtention of static critical behaviours from the renormalization group techniques of field theory, 11:30879 (R;FR;In French)
Berwald, D., *See* Cohn, D.R., 11:31173
See Tilack, M., 11:31245
Berwald, D.H., *See* Meier, W.R., 11:31210
See Moir, R.W., 11:31103, 11:31143
Besmann, T.M., *See* Stinton, D.P., 11:30143
Best, W.T., Evaluation of the miscellaneous waste evaporator at Rancho Seco, 11:29389 (RA;US)
Bethke, G.W., *See* Martin, G.F., 11:29851
Betz, F.E., *See* Francis, R.W., 11:29537
Beuttenmuller, R., Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
Bezella, W.A., *See* Mueller, C.J., 11:29860
Bickelhaupt, R.E., Method for predicting the effective volume resistivity of a sodium depleted fly ash layer, 11:29722 (RA;US)
See Dahlin, R.S., 11:29701
Bickford, W.E., *See* Mullen, M.F., 11:29753
Bielecki, A., *See* Zax, D.B., 11:30203
Bielski, B.H.J., *See* Rush, J.D., 11:30303
See Schwarz, H.A., 11:30202
Bienz, T., *See* Ashford, V., 11:30449
Bierman, A.H., *See* Kaifer, R.C., 11:30432
Bierman, M.R., *See* Cline, J.E., 11:30177
Biermann, W. J., Absorption machine with desorber-resorber, 11:30018 (P;US)
Bigelow, J.E., Proposed production of a large (~40μg) sample of ^{254}Es, 11:30308 (R;US)
See Benker, D.E., 11:29292
Biggers, D., ARC-OLOGY via TELL-A-GRAF, 11:31289 (R;US)
Biggs, B., *See* Coutrakon, G.B., 11:30456
Billerbeck, W.J., Power requirements for commercial communications spacecraft, 11:29561 (RA;US)
Billman, B.J., Windbreak effectiveness for the control of fugitive-dust emissions from storage piles - a wind tunnel study, 11:30535 (RA;US)
Billone, M., *See* Gierszewski, P., 11:31158
Billone, M.C., Modeling of tritium transport in lithium aluminate fusion solid breeders, 11:31141 (J;US)
See Liu, Y.Y., 11:31097
See Liv, Y.Y., 11:31137

Bingham, G.E., *See* Kercher, J.R., 11:30728

Binkley, M., *See* Yarema, R.J., 11:30471

Bird, F., Charge division using carbon filaments for obtaining coordinate information from detection of single electrons, 11:30478 (J;US)

See Ashford, V., 11:30449

Birkbeck, J.C., *See* Attalla, A., 11:31101

Birkmire, R.W., Thin-film tandem solar cells based on CuInSe$_2$, 11:29550 (BA;US)

Bishop, J., *See* Ruchti, R., 11:30474

Bisi, V., *See* Beuttenmuller, R., 11:30423

Bistrilich, J., *See* Breunlich, W.H., 11:31077

Biswas, N., *See* Ruchti, R., 11:30474

Bitter, M., *See* Murakami, M., 11:30995

Bjarke, D., *See* Baird, W., 11:30434

Bjarke, G.O., *See* Baird, W., 11:30433

Bjeldanes, L.F., *See* Hatch, F.T., 11:30726

Bjerle, I., Gasification - general overview, 11:29166 (R;SE)

See Holst, L., 11:29275

Bjoerner, B., *See* Bergstroem, J., 11:29200

Bjorklund, W.J., Operating radioactive liquid-fed ceramic melter system, 11:29411 (R;US)

Bjorndahl, W.D., *See* Sze, D.K., 11:31096

Bjornstad, D.J., Local economic impacts associated with pure taxable capacity changes, 11:29790 (J;US)

Blachot, J., *See* Haddad, M., 11:30925

Black, G.D., *See* Zimmerman, D.A., 11:30604

Black, J.P., *See* Yates, G.J., 11:30494

Blackburn, D., Analysis of zircaloy rewetting experiments and their implication for reactor fuel, 11:29838 (R;FR)

Blackburn, T.W. III, Local government participation in the siting of a low-level radioactive waste disposal facility: the Texas experience, 11:29319 (RA;US)

Blackfield, D.T., *See* Campbell, R.B., 11:30997

See Galambos, J.D., 11:31029

See Perkins, L.J., 11:31168

Blahnik, D.E., *See* Badalamente, R.V., 11:29852

Blaise, A., Electronic structure of the uranium(IV)-tetrakis-1,1,1-trifluoro-4-phenylbutane-2,4-dionato: magnetochemical study, 11:30152 (R;FR;In French)

Blaizot, J.P., Skyrmions, 11:30956 (R;FR)

Blake, J.B., *See* Baker, D.N., 11:30809

Blake, R. D., *See* Meek, Th. T., 11:30128, 11:30129

Blakeman, E.D., *See* Mihalczo, J.T., 11:30335

Blakeslee, A.E., Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells, 11:29525 (RA;US)

Blanchard, J., *See* Garner, J.K., 11:31152

See Gierszewski, P., 11:31158

Blanchard, W.R., *See* Murakami, M., 11:30995

Blanford, M.L., *See* Zimmerman, R.M., 11:30749

Blankenship, D.A., *See* Munson, D.E., 11:30751

Blann, M., Nuclear chemistry at Rochester, 11:30315 (R;US)

Blary, F., Maintenance and repair tools of the 900 MW PWR units in France, 11:29771 (R;FR;In French)

Blau, R.J., Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)

Bledsoe, J.L., *See* Whealton, J.H., 11:31199

Bliem, C.J., Heat cycle research experimental program, FY-1985, 11:29913 (RA;US)

See Demuth, O.J., 11:29629

Blink, J.A., Fragmentation of suddenly heated liquids in ICF reactors, 11:31189 (J;US)

The Pulse Star inertial confinement fusion reactor, 11:31223 (J;US)

See Hoffman, N.J., 11:31221

Bloch, A.N., *See* Mazumdar, S., 11:30269

Bloemer, M.J., Light emission from metal-insulator-metal structures biased near breakdown voltages, 11:30393 (R;US)

Bloomfield, H.S., *See* Juhasz, A.J., 11:29785

Blythe, G.M., *See* Rhudy, R.G., 11:29729

Bobrov, E., *See* Cohn, D.R., 11:31173

Bobrov, E.S., *See* Yang, T.F., 11:31172

Bobrowski, K., Transient phenomena in the pulse radiolysis of retinyl polyenes. 4. Environmental effects on absorption maximum of retinal radical anion, 11:30302 (J;US)

Bocola, W., *See* Pinchera, G.C., 11:30527

Bocquet, J.P., *See* Aahgar, M., 11:30924

Bodell, W.J., Inhibition by hyperthermia of repair synthesis and chromatin reassembly of ultraviolet-induced damage to DNA, 11:30700 (J;US)

Bodily, D.M., Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)

Boegel, A.J., *See* Mullen, M.F., 11:29753

Boercker, D.B., Ion diffusion at interfaces in hot plasmas, 11:30983 (R;US)

Boerman, B., *See* Ollila, H., 11:30025

Boers, R., Lidar observations of mixed layer dynamics: tests of parameterized entrainment models of mixed layer growth rate, 11:30523 (J;US)

Bogaert, G., Study of transitional Erbium nuclei (N=86) at very high spin. Highlight of dipolar transitions and medium lifetimes in the continuum, 11:30909 (R;FR;In French)

Bohac, C.E., *See* Lewis, A.R., 11:29495

Bohnsack, K.K., *See* Crossley, D.A. Jr., 11:30577

Bohr, H., Stability of SU(2) monopole in the presence of chiral fermions analysed on computers, 11:30858 (R;XA)

Bokhari, S., Partitioning problems in parallel, pipelined and distributed computing. Final Report, 11:31282 (R;US)

Bol, K.D., *See* Sunier, J.W., 11:30490

Boldu, J.L., *See* Abraham, M.M., 11:30171

Boller, J.R., Scaling experiments on plasma opening switches for inductive energy storage applications, 11:31265 (BA;US)

See Young, F.C., 11:31268

Bolton, R.D., Performance of the cylindrical drift chamber for the crystal box at LAMPF, 11:30491 (J;NL)

Bomberg, L., *See* Le Claire, R.J., 11:31165

See Yang, T.F., 11:31172

Boncoeur, M., Hot isostatic pressing of ceramics, 11:30120 (R;FR;In French)

Bond, R.L., *See* Clark, W.T. III, 11:29744

Bond, W.D., *See* Benker, D.E., 11:29292

Bonett, D., Experience in switching to heavier fuel oils, 11:29240 (RA;US)

Bonin, K.D., Efficient generation of tunable radiation below 100 nm in krypton, 11:30370 (BA;US)

High resolution laser spectroscopy of Xe(5p6 to 5p5 11s-prime) at 94.2 nm, 11:30375 (BA;US)

Boody, F., *See* Murakami, M., 11:30995

Book, S., *See* Maxon, H., 11:30695

Booth, J.W., *See* Nyhan, J.W., 11:30618

Booth, R.S., *See* Smith, O.L., 11:29858

Boozer, A.H., *See* Kuo-Petravic, G., 11:31079

Boparai, A.S., *See* Schneider, J.F., 11:30186

Borden, A. R., Multistrand superconductor cable, 11:30358 (P;US)

Bordes, P., Field tests and examinations in cell of French fuel assemblies, 11:29758 (R;FR;In French)

Borg, D.C., Cytotoxicity from coupled redox cycling of autoxidizing xenobiotics and metals: a selective critical review and commentary on work-in-progress, 11:30727 (J;IL)

Borovsky, J.E., Numerics for the simulation of electromagnetic-field propagation in nonionized and plasma media, 11:30975 (R;US)

Bosisio, L., *See* Bedeschi, F., 11:30446

Bosko, M., Similarity of EPR Signal II/ sub f/ rise and P-680$^+$ decay kinetics in Tris-washed chloroplast Photosystem II preparations as a function of pH, 11:30643 (J;NL)

Bosler, G., *See* Schenkel, R., 11:29766

Bosse, H., Axial skeleton malformations induced by 5 fluoro-2'-desoxycytidine (FCdR) and X-rays in mice of the breeding strains C57Bl/6JHanFfm, C57Bl/10JFfm, and in hamsters of the GHFfm breeding strain. A comparative evaluation considering gestation stages and dose-response-relationships, 11:30692 (R;DE;In German)

Botton, N. de, Pion photoproduction in nuclei, 11:30892 (R;FR)

Botts, T.E., Magnetically focused liquid drop radiator, 11:30404 (P;US)

Bourgault, F., Welding of sule elements for nuclear reactors with solid state YAG laser using instrumentated testing equipments, 11:30075 (R;FR;In French)

Bourgue, R.F., *See* Wong R.F., 11:31104

Bourne, S., *See* Schneider, J.F., 11:30186

Bourque, R.F., *See* Maya, I., 11:31216

Bouvier, A., *See* Campagnolo, R.E., 11:30659

Bowen, A., Bioclimatic indicators for determining passive and low energy hybrid systems - case study, Saudi Arabia, 11:29585 (RA;US)

Bowers, D.L., *See* Vandegrift, G.F., 11:30586

Bowersox, D.F., *See* Fife, K.W., 11:29294

Bowles, C.R., *See* Dam, A.S., 11:29348

Bowles, K.J., Specimen geometry effects on graphite/PMR-15 composites

during thermo-oxidative aging, 11:30144 (R;US)
Bowman, M.K., *See* Kispert, L.D., 11:30272
Box, W.D., *See* Shappert, L.B., 11:30333
Boyard, J.L., *See* Bachelier, D., 11:30905
Boyarski, A., *See* Bernstein, D., 11:30445
Boyd, D., *See* Murakami, M., 11:30995
Boyd, M.A., *See* Henderson, J.D., 11:29384
Boyd, R. D., *See* Summers, M. A., 11:30366
Braams, B.J., Low-temperature plasma near a tokamak reactor limiter, 11:30987 (J;US)
Brackenbush, L.W., A new type of REM measuring instrument, 11:30440 (J;US)
Bradburn, K., *See* Porle, K., 11:29708
Bradbury, J.N., *See* Yu, J., 11:31075
Braden, H.H., Impact of particulate control requirements: large manufacturer's viewpoint, 11:30567 (RA;US)
Bradley, F.J., Auburn Steel Company radioactive contamination incident, 11:29408 (R;US)
Bradley, J.M., *See* Wagner, R.S., 11:30427
Bradley, M.J., *See* Dam, A.S., 11:29348, 11:29386
Bradley, O.H., *See* Watson, N.D., 11:30426
Bradley, R.A., Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Brady, B.B., Vibrational predissociation of SF_6 clusters in a supersonic molecular beam, 11:30290 (J;US)
Brady, F.P., Future possibilities for (n,p) studies at intermediate energies, 11:30941 (BA;US)
Brady, V.O., *See* Hovingh, J., 11:30409
Brager, H.R., Effects of neutron irradiation at 450°C and 16 dpa on the properties of various commercial copper alloys, 11:31036 (RA;US)
Microstructural examination of pure copper and three copper alloys irradiated in FFTF, 11:30097 (R;US)
Swelling of Fe-Cr-Mn ternary alloys in FFTF, 11:31055 (RA;US)
See Garner, F.A., 11:31054
See Maziasz, P.J., 11:31048
Braile, L.W., *See* Hinze, W.J., 11:29622
Brainard, J. P., *See* Bacon, F. M., 11:30668
Bramryd, T., Fertilization with peat and wood ashes - effects on biomass production, nutrient balance and uptake of heavy metals, 11:29547 (R;SE;In Swedish)
Bramson, G., *See* Schissel, D.P., 11:31069
Brandon, S.L., *See* Kawahara, W.A., 11:30389
Brandt, K., Testing methods for lithium-molybdenum disulfide intercalation batteries, 11:29890 (RA;US)
Brandt, R.T., *See* Dam, A.S., 11:29348
Braski, D.N., Effect of helium on the tensile properties of several vanadium alloys, 11:31058 (RA;US)
Effect of neutron irradiation on the tensile properties and microstructure of several vanadium alloys, 11:30085 (R;US)
Vanadium alloy irradiation test matrix in FFTF, 11:31051 (RA;US)
Vanadium alloys for fusion reactor first wall application, 11:30089 (R;US)
Braun, R. L., *See* Mallon, R. G., 11:29265
Braun, R.L., Results of mathematical modeling of oil shale retorting in an aboveground, external-combustion, moving-bed retort, 11:29268 (BA;US)
Bravo-Ortega, A., Complex geometric optics theory in an inhomogeneous plasma. Appendix B, 11:30962 (R;US)
Brechtel, C.E., *See* Perry, H.A., 11:29257
Bredehoeft, J.D., Geologic disposal of high-level radioactive wastes: Earth-science perspectives, 11:29401 (R;US)
Bregoli, L. J., Integrated current collector and catalyst support, 11:29984 (P;US)
Breidenbach, M., Overview of the SLD, 11:30442 (J;US)
Breitbach, G., Application of the finite element method to problems with heat radiation exchange, 11:30380 (R;DE;In German)
Breloh, P., Conspectus of the results of the 1984 inventory on forest decline, 11:30705 (RA;DE;In German)
Brener, D., *See* Greer, C.W., 11:29357
Brengle, T.A., MVUSRS utility reference manual, 11:31287 (R;US)
Brennan, J.G., Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$, 11:30317 (J;US)
Brenner, H.C., *See* Variano, B.F., 11:30255
Bressan, R.A., *See* LaRosa, P.C., 11:30645
See Singh, N.K., 11:30644
Bretonneau, P., Radial injection in the Orsay cryogenic cyclotron project, 11:30408 (R;FR;In French)
Bretz, N., *See* Murakami, M., 11:30995
Breuker, H., *See* Batley, R., 11:30485
Breunlich, W.H., Muon catalyzed fusion, 11:31077 (R;US)
Briggs, B., *See* Graves, K., 11:30551
Brilmyer, G.H., *See* Mahato, B.K., 11:30053
Brinker, D., *See* Goradia, C., 11:29527
Brinkman, J.E., Geologic considerations in UMTRA Project alternate site selection process, 11:29325 (RA;US)
Brinkmoeller, B., *See* Atencio, L.G., 11:30480
Brisard, F., *See* Trochon, J., 11:30926
Brissot, R., *See* Ashgar, M., 11:30924
Britton, K., Limitations of commercial explosives and blasting caps and their effect on in situ blast design, 11:29263 (BA;US)
Broach, J.T., Transitional behavior of pulsed dc losses in superconducting solenoids with self-fields greater than B*, 11:30355 (J;US)
Bromberg, L., Design options for commercial reactors with resistive magnets, 11:31122 (J;US)
See Cohn, D.R., 11:31173
Brooks, C., Bioconversion: a new technology for waste and sludge disposal. Workshop proceedings, 11:29460 (R;US)
Brooks, J.M., Respiratory Protection Program. Programmatic description, 11:30737 (R;US)
Brooks, J.N., An impurity control test facility (ICTF) for the study of fusion reactor/plasma edge materials, 11:31161 (J;US)
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
Sputtering performance of a pumped limiter for an ignition tokamak, 11:31090 (J;US)
See Ehst, D.A., 11:31197
See Krauss, A.R., 11:31236
Bross, A.D., Performance of radiation hard CCDs as tracking devices, 11:30475 (J;US)
Properties of new scintillation glasses and scintillating fibers, 11:30473 (J;US)
Brossard, J., Characterization of the pressure field induced by the explosion in air of a hydrocarbon-air a mixture with slow deflagration or fast deflagration, 11:29798 (R;FR;In French)
Browall, K. W., *See* Iacovangelo, C. D., 11:29986
Browell, E.V., Airborne Lidar measurements of aerosols, mixed layer heights, and ozone during the 1980 PEPE/NEROS summer field experiment, 11:30538 (R;US)
Brown, D., *See* McWhorter, D.B., 11:29284
Brown, D. P., combined cold compressor ejector helium refrigerator, 11:30017 (P;US)
Brown, D.I., Eddy current modelling and poloidal field penetration in TFTR, 11:31260 (BA;US)
Brown, D.R., Value of solar thermal industrial process heat, 11:29601 (R;US)
Brown, D.W., *See* Musket, R.G., 11:30113
Brown, G.M., *See* King, R.B., 11:30231
Brown, G.R., US Department of Energy Three Mile Island research and development program. 1985 annual report, 11:29843 (R;US)
Brown, G.W., Engineering design of the ALT-II pump limiter for TEXTOR, 11:31251 (J;US)
Brown, M.A., Strategy for accelerating the use of energy-conserving building technologies, 11:30019 (J;US)
Brown, P.W., *See* Struble, L.J., 11:29612
Brown, R.D., Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys, 11:30099 (R;US)
Brown, R.L., *See* Lester, D.F., 11:30784
Brown, T.G., Compact ignition tokamak design studies, 11:31025 (R;US)
Configuration development and structural assessment of the FEDC ignitor concept, 11:31030 (R;US)
See Strickler, D.J., 11:31186
Brown, V.R., *See* Brady, F.P., 11:30941
Brown, W. F., *See* Christiansen, D. W., 11:29808
Brown, W.G., *See* Sauer, M.C. Jr., 11:30299
Browne, E.N.C., *See* Greer, C.W., 11:29357
Browning, L.H., *See* Pefley, R.K., 11:30069
Browne, J., *See* McCourt, P., 11:30630
Bruessau, W.D., Real-time evaluation of electron and current density profile

parameters on TEXTOR, 11:30973 (R;DE)
Brumbach, S.B., Measurements of $^{10}B(n,He)$ reaction rates in a mockup control rod in ZPPR, 11:29777 (R;US)
Brummett, A.R., *See* Dumont, J.N., 11:30672
Bruner, M., *See* Harrison, R.A., 11:30789
Bruneske, J.D., *See* Allen, G.C., 11:30348
Brunner, H., Recent experiences with cement solidification systems, 11:29378 (RA;US)
Bruno, J.W., C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes, 11:30318 (J;US)
Brunor, G., *See* Nieuwland, H.C.D., 11:30094
Brunschwig, B.S., Kinetics and mechanisms of electron transfer between blue copper proteins and electronically excited chromium and ruthenium polypyridine complexes, 11:30292 (J;US)
Bryan, R.H., Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)
Bryan, W.E., *See* Baity, F.W., 11:31026
See Hoffman, D.J., 11:31028
Bryant, W.R., *See* Shephard, L.E., 11:30750
Buchanan, A.C. III, *See* Chapman, D.M., 11:30244
Buchenauer, C.J., *See* Massey, R.S., 11:31177
Buchholz, D., *See* Yoshida, R., 11:30458
Budden, R.J.R., Commercial aspects of CHP and private generation: an Electricity Supply Industry viewpoint, 11:29677 (R;GB)
Budney, G.S., Technology transfer on the heber geothermal binary demonstration power plant project, 11:29625 (RA;US)
Budny, R.V., *See* Kilpatrick, S.J., 11:30980
Bufkin, B.A., *See* Robinson, R.L. Jr., 11:29176
Bujnoseek, J.J., *See* Yates, G.J., 11:30494
Bullock, C., *See* Sparks, L.E., 11:29733
Bullock, J.S., *See* Giles, G.E., 11:30328
Bullock, K.R., *See* Mahato, B.K., 11:30053
Bulmer, R.H., *See* Henning, C.D., 11:31123
Buncher, C., *See* Maxon, H., 11:30695
Bunker, B.C., Solution chemistry of silicate and borate materials, 11:30163 (R;US)
Boon, J., Depolarization effects in a ring equipped with snakes, 11:30421 (R;FR)
Spin-transparent vertical beam kicker, 11:30420 (R;FR)
Burbidge, B.L.H., *See* Richmond, R., 11:29815
Burckle, J.O., Evaluation of an air curtain secondary hooding system, 11:30531 (RA;US)
Burger, L.L., *See* Scheele, R.D., 11:29425
Burke, A.F., Computer-aided design of electric and hybrid vehicles, 11:30065 (BA;GB)
See Hardin, J.E., 11:30051
Burke, W.R., Proceedings of ESA sessions at the 16th IEEE annual power electronics specialists conference, 11:29506 (R;FR)
Burkhardt, C., *See* Jacobson, A., 11:31262
Burkhardt, L.C., *See* Massey, R.S., 11:31177
Burklund, P. W., Method for isolating two aquifers in a single borehole, 11:30405 (P;US)
Burnett, G., *See* Landwehr, J.P., 11:29739
Burnett, S.M., *See* Fewell, M.P., 11:30919
Burrell, C.F., *See* Stearns, J.W., 11:31219
Burrell, K.H., *See* Kahn, C., 11:30989
Burton, H.M., *See* Quinn, G.J., 11:29297
Burwell, E.L., Underground coal gasification: status and promise, 11:29173 (B;US)
Burwell, R.L. Jr., *See* Marks, T.J., 11:30195
Busch, J.F., Monitored performance of new, low-energy homes: updated results from the BECA-A data base, 11:30001 (R;US)
Buschmann, J.C., Start-up and operating experience with a reverse air fabric filter as part of the University of Minnesota dry FGD system, 11:29194 (RA;US)
Busenitz, J., *See* Ruchti, R., 11:30474
Bush, C.E., *See* Murakami, M., 11:30995
Bush, D.V., Performance of large-diameter wires as discharge electrodes in electrostatic precipitators, 11:29716 (RA;US)
Bush, P.V., Laboratory analysis of corona discharge electrodes and back corona phenomena, 11:29719 (RA;US)
See Pontius, D.H., 11:29724
Bushnell, C.W., *See* Spampinato, P.T., 11:31031
Busing, W.R., Application of external forces to computational models of crystals, 11:30116 (J;DK)
Bussell, G.T., Fusion facility siting considerations, 11:31215 (J;US)
See Barrett, R.J., 11:31232
Busza, W., *See* Johnson, A.S., 11:30477
Butkovich, T.R., Spent Fuel Test-Climax mineby revisited, 11:29418 (R;US)
Thermomechanical modeling of the Spent Fuel Test-Climax, 11:30756 (R;US)
Butler, C.F., *See* Browell, E.V., 11:30538
Butler, P.C., Flowing electrolyte batteries test methods and results, 11:29887 (RA;US)
Overview of rechargeable battery testing in the United States, 11:29884 (RA;US)
Buttener, W.E., Advanced German Operator Support Systems, 11:29871 (J;US)
Buttner, W., *See* Boska, M., 11:30643
Buzbee, B.L., Two parallel formulations of particle-in-cell models, 11:31291 (BA;US)
Byerlee, J., Permeability and pore-fluid chemistry of the Bullfrog Tuff in a temperature gradient: summary of results, 11:30761 (R;US)
Byers, L.L., *See* Cline, J.E., 11:30177
Byrd, R.C., *See* Taddeucci, T.N., 11:30487
Byrne, A.P., Spectroscopy of high spin states in sup(211,212,213)Fr, 11:30922 (R;AU)
See Gerl, J., 11:30916
See Poletti, A.R., 11:30920
See Poletti, S.J., 11:30921

C

Cabasino, L., *See* Bradley, F.J., 11:29408
Cable, M.D., Wide angle measurement of beta-delayed two-proton radioactivity of ^{22}Al, 11:30907 (RA;US)
Cabrespine, A., *See* Bretonneau, P., 11:30408
Cadwell, L.L., *See* McKenzie, D.H., 11:29446
Caffrey, A.J., Radiation damage studies on BaF_2 and BGO scintillator materials, 11:30472 (J;US)
Cagnetti, P., Local scale atmospheric diffusion at a coastal site in the presence of breeze effects (Phase I and II: data collection at a coastal site and off shore). Vol. 2, 11:30558 (R;FR)
Caitucoli, F., *See* Sicre, A., 11:30927
Calcaterra, S., *See* Augustin, J.E., 11:30837
Caldwell, R., Forecasting at Sierra Pacific Power Company, 11:29973 (RA;US)
Caldwell, R.W., Getting end-use load shape data for commercial buildings - the energy information project at Sierra Pacific Power Company, 11:29965 (RA;US)
Call, W.R., *See* Batzer, T.H., 11:31190
See Schumacher, B.J., 11:31254
Callaghan, W.T., Flat-Plate Solar Array Project (FSA) progress and plans, 11:29558 (BA;US)
Callahan, A.P., *See* Goodman, M.M., 11:30652
Callcott, T.A., *See* Bloemer, M.J., 11:30393
See Little, J.W., 11:30115
Calo, J.M., Active sites in char gasification. Quarterly technical progress report, 1 January-31 March 1986, 11:29160 (R;US)
Cameron, B.J., *See* Scott, M.L., 11:30341
Cameron, D.S., *See* Cline, J.E., 11:30177
Cammarata, K., *See* Radmer, R., 11:29502
Campagnolo, R.E., System architecture for high speed reconstruction in Time-Of-Flight positron tomography, 11:30659 (R;FR)
Campbell, C.T., Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Campbell, D.O., Acid-split flowsheets for uranium-plutonium partitioning without a reductant, 11:29293 (R;US)
See Benker, D.E., 11:29292
Campbell, R., *See* Molvik, A.W., 11:30985
Campbell, R.B., Physics-magnetics trade studies for tandem mirror reactors, 11:30997 (J;US)
See Fenstermacher, M.E., 11:30996
See Perkins, L.J., 11:31168
Canales, T., *See* Johnson, R.R., 11:31084
Cangini, D., Design, manufacturing and commissioning of mobile unit for EDF (Dow Chemical process), 11:29358 (RA;US)
Canning, A., Forecasting electricity use in the service sector, 11:29974 (RA;US)
Cannon, R.D., *See* Zinnecker, H., 11:30795
Cape, J.A., *See* Partain, L.D., 11:29524
Caponetti, E., *See* Triolo, R., 11:30263
Cappiello, C., *See* Copenhaver, C., 11:31175

Cappiello, M., Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility, 11:29844 (R;US)
Cappiello, M.W., *See* Spore, J.W., 11:29845
Caputo, A.J., Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration, 11:30130 (BA;US)
See Stinton, D.P., 11:30143
Carew, J.F., *See* Cokinos, D.M., 11:29825
Carey, A. A., Method for controlling the viscosity of siloxane oils, 11:29249 (P;US)
Carey, T.A., *See* Taddeucci, T.N., 11:30487
Cargnelli, M., *See* Breunlich, W.H., 11:31077
Carli, B., Measurements of neutral constituents using far infrared remote sensing techniques, 11:30539 (R;IT)
Carlson, K.D., *See* Emge, T.J., 11:30245
Carlson, N.M., Ultrasonic inspection of partially completed welds using pattern recognition techniques, 11:30384 (R;US)
Carlsson, L.G., Energy use in the service sector in Sweden, 11:29951 (RA;US)
Carmel, P.G., *See* Pavelek, M.D. II, 11:29360
Carmel, Y., *See* Fliflet, A.W., 11:31270
Carney, T., *See* Durham, M., 11:29711
Carr, J., *See* Hodges, C., 11:30452
See Young, C.C., 11:30476
Carr, R.C., *See* Belba, V., 11:29689
Carr, R.W. Jr., Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals, 11:30286 (J;US)
Carroll, R.B., *See* Esmaili, E., 11:29286
Carson, C.C., Use of an acoustic borehole televiewer to investigate casing corrosion in geothermal wells, 11:29623 (R;US)
Carson, R.S., *See* Freije, S.A., 11:31211
Carter, M.R., *See* Stewart, M.E., 11:30984
Carter, R.J., TSORT - an automated tool for allocating tasks to training strategies, 11:29791 (R;US)
Carter, T.J., Fifteen years of radioactive waste management at Ontario Hydro, 11:29372 (RA;US)
Caruccio, F.T., Acid mine drainage: surface mine treatment and in-situ abatement technology, 11:29189 (RA;US)
Carumbella, D., *See* Johnson, A.S., 11:30477
Carvitti, J., Feasibility of using parameter monitoring as an aid in determining continuing compliance of particulate control devices, 11:29741 (RA;US)
Casadei, F., EURDYN-1D: a computer code for the one-dimensional non-linear dynamic analysis of structural systems. Description and users' manual (release 1), 11:31279 (R;FR)
Cash, R.J., *See* Allen, C.R., 11:30340
Cash, W., *See* Scott, M.L., 11:30341
Cashdollar, K.L., *See* Weiss, E.S., 11:29260
Cason, N., *See* Ruchti, R., 11:30474
Caspar, T., Alterations in growth, photosynthesis, and respiration in a starchless mutant of Arabidopsis thaliana (L.) deficient in chloroplast phosphoglucomutase activity, 11:30627 (J;US)
Casper, T.A., *See* Stewart, M.E., 11:30984
Casperd, A.N., *See* Duncumb, W.R., 11:30396
Castaing, C., *See* Blary, F., 11:29771
Castaneda, C.M., *See* Brady, F.P., 11:30941
Castle, G.S.P., Charging of particulates by evaporating charged water droplets, 11:29694 (RA;US)
Castleman, A.W. Jr., *See* Upschulte, B.L., 11:30212
Castoldi, C., *See* Yoshida, R., 11:30458
Catena, C., DNA repair in PHA stimulated human lymphocytes, 11:30691 (R;IT;In Italian)
Cathey, L., *See* Jones, E.R. Jr., 11:30219
Cattani, M.S.D., Statistical principle and the quarks, 11:30863 (R;BR)
Caughman, J.B.O., *See* Hoffman, D.J., 11:31191, 11:31193
Cave, R.J., Mutual orientation effects on electron transfer between porphyrins, 11:30240 (J;US)
Cavin, O.B., *See* Finch, C.B., 11:30140
Cawley, W. E., Fuel assembly for the production of tritium in light water reactors, 11:29755 (P;US)
Cayla, O., Study of metallic materials behavior in low oxygen activity atmospheres, 11:30077 (R;FR;In French)
Cayton, T., *See* Massey, R.S., 11:31177
Cecil, F.E., Method for determining fast-alpha-particle confinement in tokamak plasmas using resonant nuclear reactors, 11:30978 (R;US)
Cen, P., Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
Cena, R.J., *See* Stephens, D.R., 11:29172
Ceruy, J., *See* Cable, M.D., 11:30907
Cervelli, F., *See* Bedeschi, F., 11:30446
Cesta, T., *See* Kashdan, E.R., 11:29728
Cha, Y., *See* Ehst, D.A., 11:31197
Cha, Y.S., Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)
Chabanas, L., *See* Campagnolo, R.E., 11:30659
Chadwick, G., *See* Hodges, C., 11:30452
See Young, C.C., 11:30476
Chae, S.I., *See* Haller, G.M., 11:30457
Chaffee, A.D., *See* Copenhaver, C., 11:31175
Chaikin, A.M., *See* Arutiunov, V.S., 11:30233
Chambert, L., *See* Almqvist, P., 11:29223
Chan, D.W., Selection and evaluation of potential very low level wastes (VLLW) from nuclear power plants, 11:29364 (RA;US)
Chan, H.M., Constrained Lagrangian theory for monopoles, 11:30886 (R;GB)
Gauge theories in loop space, 11:30885 (R;GB)
Chan, Y., *See* Schmidt, H.R., 11:30482
Chang, R.K., Intermittency and conditional velocities in premixed conical turbulent flames, 11:30324 (R;US)
Chang, S.H., *See* Tzeng, G.H., 11:29958
Channell, J.K., *See* Chaturvedi, L., 11:30740
Chapline Jr., G. F., Method and apparatus for molecular imaging using x-rays at resonance wavelengths, 11:30503 (P;US)
Chapman, D.M., Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_n$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Chapman, P., Generic battery model for electric and hybrid vehicle simulation performance prediction, 11:30067 (BA;GB)
Charbonneau, S., FRAMATOME PWR technological development, 11:29767 (R;FR)
Chase, E.B., *See* Solley, W.B., 11:30603
Chase, S.T., Sunyaev-Zeldovich effect at 1.15 mm wavelength, 11:30802 (RA;GB)
Chattin, F.R., *See* Benker, D.E., 11:29292
Chattopadhyay, S.K., Laser flash photolytic determination of triplet yields via singlet oxygen generation, 11:30297 (J;CH)
Role of geometric distortion in the quenching behaviors of all-trans 1,4-diphenyl-1,3-butadiene triplet, 11:30279 (J;CH)
Chaturvedi, L., Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
Chauvet, J.P., *See* Kamat, P.V., 11:30284
Chemla, D.S., *See* Sermage, B., 11:30156
Chen, B., Geothermal research at the Puna Facility. Technical report, 11:29642 (R;US)
Chen, I.W., *See* Argon, A.S., 11:30118
Chen, K.W., *See* Baldwin, R.M., 11:29271
Chen, W., *See* Dursch, H., 11:29533
Chen, Y., *See* Abraham, M.M., 11:30171
Cheng, E.T., Low activation burning core reactor design studies, 11:31241 (J;US)
Nuclear data needs for fusion energy development, 11:31124 (J;US)
See Hopkins, G.R., 11:31002
See Sze, D.K., 11:31140
See Wong R.F., 11:31104
Cheng, H.S., *See* Wulff, W., 11:29828
Chenise, G., *See* Radmer, R., 11:29502
Cheshire, D., *See* Moffa, P., 11:31012
Chesi, E., *See* Beuttenmuller, R., 11:30423
Chew, C.K., Charged-particle multiplicity distributions in e^+e annihilation and negative binomial distributions, 11:30860 (R;XA)
Chiarelli, G., *See* Bedeschi, F., 11:30446
Childress, P.C., Defueling canister designs for the TMI-2 core removal program, 11:29761 (RA;US)
See McGuinn, E.J., 11:29759
Childs, K.W., *See* Llewellyn, G.H., 11:30106
Chisholm, M.H., Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_6(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_6$(M identical with M) and i-PrOH leading to $W_2(H)_2(O\text{-}i\text{-}Pr)_{14}$, 11:30210 (J;US)
Chitsomboon, T., Investigation of chemically-reacting supersonic

internal flows. Progress report, 11:30034 (R;US)
Chiu, J., *See* Weeds, J., 11:31206
Chiu, S.C., *See* Harvey, R.W., 11:30994
Cho, A.Y., *See* Sermage, B., 11:30156
Cho, S., *See* Swanson, D.G., 11:30963
Chockie, A.D., *See* Brown, D.R., 11:29601
Choi, C., *See* Fischer, R., 11:30165
Choi, C.G., *See* Li, S.B., 11:29534
Chollet, R., *See* Holbrook, G.P., 11:30633
Chong, Y., A new oil shale retort fluid beds exchanging solids but not gases, 11:29270 (BA;US)
Choppin, G.R., Calorimetric studies of curium complexation, 11:30320 (J;US)
See Roberts, R.A., 11:30311
Chopra, O.K., Compatibility of Li_2O in a flowing helium environment, 11:31040 (RA;US)
Environmental effects on properties of structural alloys in flowing lithium, 11:31039 (RA;US)
Liquid-metal corrosion, 11:31098 (J;US)
Chou, C.H., I. Kinetic and mechanistic study of the [4+4] dimerization of 2,3-dimethylene-2,3-dihydrofuran. II. Preparation of 2,3-dimethylene-2,3-dihydrobenzo[B]furan by the flash vacuum pyrolysis of 2-methyl-3-benzo[B]furylmethyl benzoate. III. Reaction of 2,3-dimethylene-2,3-dihydrofuran with triplet oxygen, 11:30270 (D;US)
Chou, J.S., Single shot laser multiphoton ionization detection of UF_5 following the 266 nm photodissociation of UF_6, 11:30300 (J;CH)
Choudhury, K., *See* Pesaran, A.A., 11:29604
Chow, C.K., Model for growth of beta-phase particles in zirconium-2.5 wt% niobium, 11:30119 (R;CA)
Chowdhuri, P., Transient voltage oscillations in coils, 11:31185 (J;US)
Chreitzberg, A.M., Accelerated life cycle test advanced lead-acid cells at elevated temperature, 11:29943 (RA;US)
Chrien, R.E., *See* Rej, D.J., 11:31263
See Siemon, R.E., 11:31264
Christ, B., *See* Brunner, H., 11:29378
Christensen, A., *See* Yde, C., 11:30590
Christiansen, D. W., Funnel for fuel pin loading system, 11:29808 (P;US)
Christie, W.H., *See* Todd, P.J., 11:30277
Chrysochoides, N.G., High flux testing reactor Petten. Replacement of the reactor vessel and connected components. Overall report, 11:29820 (R;FR)
Chu, K.R., *See* Fliflet, A.W., 11:31270
Chu, T.K., *See* Bernabei, S., 11:30990
Chuang, C.F., *See* Ahluwalia, R.K., 11:29669
Chung, K.E., Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)
Church, E.L., Spectral and parameter estimation problems arising in the metrology of high performance mirror surfaces, 11:30955 (R;US)
Chutjian, A., S-wave threshold in electron attachment - observations and cross sections in CCl4 and SF6 at ultralow electron energies, 11:30818 (J;US)
Ci, X., *See* Lee, L.Y.C., 11:30288
Cianetti, C., *See* Danesi, P.R., 11:30187
Ciazynski, D., Contribution to the study of superconducting magnets, 11:30339 (R;FR;In French)
Cigna, A.A., Pollution problems in border karst regions, 11:30610 (R;IT)
Ciliberti, D.F., *See* Lippert, T.E., 11:29687
Ciliberti, D.R., Development and high temperature application of a novel method for measuring ash deposits and cake removal on filter bags, 11:29688 (RA;US)
Cirillo, M.C., *See* Pinchera, G.C., 11:30527
Ciszek, T.F., Method and apparatus for casting conductive and semiconductive materials, 11:30170 (P;US)
Clapp, N.E., *See* Smith, O.L., 11:29858
Clapp, N.E. Jr., *See* Stone, R.S., 11:29854
Clark, C.W., Possibilities for achieving x-ray lasing action by use of high-order multiphoton processes, 11:30365 (J;US)
Clark, E.E., Passive-hybrid cooling and load avoidance in very hot climates, 11:29584 (RA;US)
Clark, F.H., *See* Stone, R.S., 11:29854
Clark, F.T., High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
Clark, L.M., Computing Services Software Library, 11:31293 (R;US)
Clark, R., *See* Goradia, C., 11:29527
Clark, W.T. III, Measurement of the electrokinetic transport properties of particles in an electrostatic precipitator, 11:29744 (RA;US)
Cleaver, J.E., Defective DNA repair and cancer-prone disorders of man, 11:30674 (BA;US)
See Bodell, W.J., 11:30700
Clegg, D.B., *See* Bross, A.D., 11:30475
Clement, P., *See* Deruaz, R., 11:29837
Clement, P.C., *See* Wong R.F., 11:31104
Clements, J.S., Particle charging with an electron beam precharger, 11:29693 (RA;US)
Clemmer, R.G., *See* Billone, M.C., 11:31141
See Liu, Y.Y., 11:31097
Clerc, M., Production of a Raman laser at 16 μm, 11:29290 (R;FR;In French)
Cline, J.E., Analytical techniques for the in-situ quantification of low-level waste, 11:30177 (RA;US)
Cloke, M.S., *See* Davies, P.G., 11:29643
Clover, M.R., *See* Sunier, J.W., 11:30490
Cnare, E.C., *See* Cowan, M., 11:30352
Cochrane, J.C., *See* Rej, D.J., 11:31263
See Siemon, R.E., 11:31264
Coffer, H., Overview geopressure program, 11:29914 (RA;US)
Cohen, N., *See* Linsalata, P., 11:30619
Cohn, D.R., Compact minimum cost ignition test reactor, 11:31173 (J;US)
See Le Claire, R.J., 11:31165
See Yang, T.F., 11:31172
Cohn, S.M., *See* Sheffield, J., 11:31085
Cokal, E.J., *See* Perkins, B.A., 11:29403
Cokinos, D.M., Effects of rod worth and drop speed on the BWR off-center rod drop accident, 11:29825 (R;US)
Colburn, R. P., Fission gas detection system, 11:29875 (P;US)
Cole, L.A., *See* Benner, J.P., 11:29517
Cole, W.H., Impact of proposed acid rain legislation on power plant particulate control equipment, 11:29692 (RA;US)
Colleraine, A.P., *See* Hong, R., 11:31207
Collins, C.A., Infrared search for primeval galaxies, 11:30801 (RA;GB)
Collins, J.C., *See* Berger, E.L., 11:30848
Collins, J.L., *See* Lorenz, R.A., 11:29748
See Osborne, M.F., 11:29855
Collins, P.J., *See* Brumbach, S.B., 11:29777
Coltman, R.R. Jr., *See* Kerchner, H.R., 11:29818
Colvin, C.M., Management of high specific activity tritiated liquid wastes, 11:29407 (RA;US)
Combescure, A., *See* Hoffmann, A., 11:30151
Comins, J.D., *See* Allen, A.M.T., 11:30158
Commander, J.C., Tokamak Fusion Core Experiment facilities Functional and Operational Requirements, 11:31127 (J;US)
Commisso, R.J., *See* Boller, J.R., 11:31265
Compton, R.N., *See* Hamadani, S.M., 11:30811
Conboy, J.E., Constant scattering length fits to low energy Kp interactions, 11:30844 (R;GB)
Conklin, A.W., Waste management practices to control biological transport of radioactivity at the Hanford Site, 11:29434 (RA;US)
Conlin, J.A., Irradiation experiments for the US/Japan collaborative testing program in HFIR and ORR, 11:31052 (RA;US)
Operation of the ORR spectral tailoring experiments (ORR-MFE-4A and ORB-MFE-4B), 11:31044 (RA;US)
Conn, R.W., Strategic framework for the magnetic fusion energy program, 11:31009 (J;US)
Connell, H., *See* Jo, J.H., 11:29827
Considine, M., Thermal radiation hazard ranges from large hydrocarbon pool fires, 11:30563 (R;GB)
Contardo, D., *See* Bachelier, D., 11:30905
Cook, J., Solar architecture since 1970: passive and low energy innovations, 11:29581 (RA;US)
Cook, J.D., *See* Emge, T.J., 11:30245
Cooke, C.M., *See* Gordon, L.B., 11:29564
Cooke, S.D., *See* Martin, J.W., 11:29170
Cooks, R.G., New mass spectral methods for coal characterization. Final report, July 15, 1982-September 14, 1985, 11:29174 (R;US)
Coombes, H., *See* Kapustinsky, J.S., 11:30489
Cooney, J.V., *See* Mushrush, G.W., 11:29274
Coonrod, J., *See* Brown, D.I., 11:31260
Cooper, A.C., *See* Fields, D.E., 11:29778
Cooper, C.A., Experimental investigation of the effect of clad ballooning on the effectiveness of PWR emergency cooling, 11:29839 (R;FR)
Cooper, M., *See* Beck, R.N., 11:30663
Cooper, M.D., *See* Bolton, R.D., 11:30491
Cooper, R., *See* Denison, L.S., 11:30250
Cooperstein, G., *See* Boller, J.R., 11:31265
Copenhaver, C., Fusion-power-core design of a compact Reversed-Field Pinch Reactor (CRFPR), 11:31175 (J;US)
Copenhaver, E.D., *See* Brown, M.A., 11:30019
Corbella, O., *See* Basso, M., 11:29594

Cordier, A., Measurement of the $F_2 sup(\gamma)$ photon structure function at LEP, 11:30874 (R;FR)
Cordier, J.P., *See* Cangini, D., 11:29358
Cormier, M.J., *See* Harmon, A.C., 11:30640
Cornish, K., Movement of abscisic acid into the apoplast in response to water stress in Xanthium strumarium L., 11:30678 (J;US)
Corradini, M.L., *See* Sviatoslavsky, I.N., 11:31151
Corsi, F., Elasto-plastic benchmark calculations. Step 1: verification of the numerical accuracy of the computer programs, 11:31278 (R;FR)
Corugedo, J.J., *See* Murray, K.A., 11:31222
Corwin, W.R., Effect of nickel content on the aging and irradiation response of impact properties of 9 Cr-1 MoVNb and 12 Cr-1 MoVW in the absence of internal helium effects, 11:31061 (RA;US)
Cosme, G., *See* Augustin, J.E., 11:30837
Coster, J.M. de, *See* Bretonneau, P., 11:30408
Costin, L.S., Analysis of triaxial testing using a fracture damage model, 11:30386 (R;US)
Cottingame, W.B., *See* Seestrom-Morris, S.J., 11:30939
Cottle, R.W., *See* Aganagic, M., 11:30961
Cotton, T.M., *See* Feng, Q., 11:30285
Coulter, M., *See* Jensen, J.R., 11:30595
Coulter, R.L., *See* Boers, R., 11:30523
Coupal, D., *See* Bernstein, D., 11:30445
Coutant, C.C., Temperature selection by juvenile striped bass in laboratory and field, 11:30702 (J;US)
Coutrakon, G.B., Ring imaging Cherenkov detector prototype results for E665 at Fermilab, 11:30456 (J;US)
Covill, I.D., Acid smut emission problems associated with Tufts Cove Generating Station, 11:29683 (RA;US)
Cowan, M., Reconnection gun, 11:30352 (R;US)
Cowherd, C. Jr., Technical manual on the identification, assessment, and control of fugitive emissions, 11:30532 (RA;US)
Cox, D.K., *See* Coutant, C.C., 11:30702
Cox, J.W., *See* Watson, N.D., 11:30426
Coy, D.W., *See* Kashdan, E.R., 11:29728
Crabol, B., Assessment of the dispersion of fission products in the atmosphere following a reactor accident under meteorological conditions of low wind speeds with or without high temporal and spatial variability in wind speed and direction, 11:30559 (R;FR)
Craddick, W.G., *See* Smith, O.L., 11:29858
Craig, R.B., *See* Eyman, L.D., 11:29330
Crancon, J., *See* Haddad, M., 11:30925
Crane, T.W., Method and apparatus for determining the content and distribution of a thermal neutron absorbing material in an object, 11:30479 (P;US)
Craven, C.A., *See* Megusar, J., 11:31064
Crawford, B.D., *See* Stallings, R.L., 11:30724
Crawford, E.A., Soft X-ray source based on a low divergence, high repetition rate ultraviolet laser, 11:30371 (BA;US)
Crawford, J., *See* Rowan-Robinson, M., 11:30803
Crawley, H.B., Design and performance of a CCD based readout for the DELPHI barrel electromagnetic calorimeter, 11:30467 (J;US)
Creedon, R.L., *See* Cheng, E.T., 11:31241
See Maya, I., 11:31216
See Wong R.F., 11:31104
Creelman, R.A., Abscisic acid accumulation in spinach leaf slices in the presence of penetrating and nonpenetrating solutes, 11:30682 (J;US)
Creer, J.M., *See* McKinnon, M.A., 11:29303
Cresswell, J.V., *See* Wait, G.D., 11:30417
Creutz, C., *See* Keene, F.R., 11:30225
Crisostomo, M.C., *See* Sunderman, F.W. Jr., 11:30654
Cromer, D.T., *See* Wrobleski, D.A., 11:30319
Cronwell, J.B., Inertial fusion reactors and magnetic fields, 11:31228 (J;US)
Crosetti, M.R., Sensitivity analysis of central station flat-plate photovolaic systems and implications for National Photovoltaics Program planning, 11:29559 (R;US)
Cross, F.L. Jr., Air pollution control: maintenance cost savings from the washing, patching and reuse of bags used in fabric filters, 11:30406 (RA;US)
Crossley, D.A. Jr., Effects of pesticide on biota and breakdown of forest litter, 11:30703 (BA;RO)
Long-term ecological study in the Oak Ridge area. III. The oribatid mite fauna in pine litter, 11:30577 (J;US)
Crosthwaite, J.L., *See* Johnson, L.H., 11:29315
Crouse, D.J., *See* Benker, D.E., 11:29292
See Campbell, D.O., 11:29293
See Hurst, F.J., 11:29424
Crowe, K.M., *See* Breunlich, W.H., 11:31077
Crowley, J.L., Evaluation of the Motor-Operated Valve Analysis and Test System (MOVATS) to detect degradation, incorrect adjustments, and other abnormalities in motor-operated valves, 11:29802 (R;US)
Crynack, R.R., Use of a mobile electrostatic precipitator for pilot studies, 11:29698 (RA;US)
Crynes, B.L., Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
Csorna, S., *See* Hodges, C., 11:30452
See Young, C.C., 11:30476
Cuderman, J.F., Effects of wellbore liquids in propellant-based fracturing, 11:29251 (R;US)
Cuhen, D., *See* Abou-Elfotouh, F., 11:29552
Cullen, W.H., Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
Cummins, W.F., *See* Molvik, A.W., 11:30985
Cundy, M.R., *See* Chrysochoides, N.G., 11:29820
Cunningham, J., *See* Ruchti, R., 11:30474
Curl, R.F., *See* Zhang, Q.L., 11:30248
Curreri, J., *See* Subudhi, M., 11:29850
Curtis, H.B., Performance of Hughes GaAs concentrator cells under 1-MeV electron irradiation, 11:29536 (RA;US)
Curtis, R., *See* Turiel, I., 11:29978, 11:30020
Curtiss, L.A., Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON, 11:30211 (J;US)
Cutler, A.R., Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986, 11:30236 (R;US)
Cygan, R.T., *See* Westrich, H.R., 11:29639
Cywin, A., Management of active and abandoned hazardous sites under federal statutes, 11:29331 (RA;US)
Czajkowski, C.J., *See* Higgins, J.C., 11:29803
Czanderna, A. W., *See* Pitts, J. R., 11:29610
Czech, A., *See* Armstrong, D.W., 11:30260
Czech, B.P., *See* Armstrong, D.W., 11:30260

D

Dabiri, A.E., *See* Strickler, D.J., 11:31186
Dacey, P.W., An overview of international NO/sub x/ control regulations, 11:29229 (R;GB)
Dagenhart, W.K., An alpha particle diagnostic beam line system to generate an intense Li^0 beam with an ORNL SITEX source, 11:31200 (J;US)
Dahlbom, M., *See* Hoffman, E.J., 11:30439
Dahlin, R.S., Field study of a combined NH_3-SO_3 conditioning system on a cold-side fly ash precipitator at a coal-fired power plant, 11:29701 (RA;US)
See Faulkner, M.G., 11:29696
Dahlman, R.C., Behavior of ^{137}Cs-tagged particles in a fescue meadow, 11:30701 (BA;XA)
Daling, P.M., Assessment of spent nuclear fuel shipping cask handling capabilities of commercial light water reactors, 11:29304 (R;US)
Dam, A.S., Comparison between mobile VR services and central VR service facility for dry active waste, 11:29386 (RA;US)
Low-level volume reduction services facility, 11:29348 (RA;US)
Dam, P., *See* Batley, R., 11:30485
Dameron, H.J., Solid waste minimization at Duke Power Company, 11:29366 (RA;US)
Damgaard, P.H., *See* Berger, E.L., 11:30878
Damien, D.A., *See* Nave, S.E., 11:30190
Damle, A.S., Modeling of SO_3 removal in spray-dryer flue-gas desulfurization system, 11:29193 (RA;US)
See Ensor, D.S., 11:30528

Danen, W.C., *See* Setser, D.W., 11:30264
Danesi, P.R., Permeation of metal ions through a series of two complementary supported liquid membranes, 11:30187 (J;NL)
Daniels, W.B., *See* Variano, B.F., 11:30255
Danna, R., *See* Chan, D.W., 11:29364
Darden, C., Participation in the ARGUS experiment at the DORIS collider at DESY, Hamburg, Germany, 11:30823 (R;US)
Daronian, P., Using last event estimator for detection calculations, 11:30945 (R;FR)
Darrow, J.R., *See* Gervasi, M., 11:29737
Darwish, M.A., *See* Elsayed, M.M., 11:29572
Das, P.K., *See* Battacharyya, S.N., 11:30296
See Bobrowski, K., 11:30302
See Chattopadhyay, S.K., 11:30279, 11:30297
See Reichel, L.W., 11:30298
See Wismontski-Knittel, T., 11:30276
Datta, T., *See* Jones, E.R. Jr., 11:30219
Daub, G.H., *See* Silverman, I.R., 11:30259
Daub, G.J., Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Dauben, D.L., *See* Suffridge, F.E., 11:29233
Daud, T., *See* Mokashi, A.R., 11:29504
Daum, M., *See* Lipfert, F.W., 11:30553
Dauzvardis, P.V., *See* Reed, C.B., 11:31110
Davidson, G.S., Practical paradigm for parallel processing problems, 11:31284 (R;US)
Davidson, J.H., Electrostatic precipitator facility for turbulence research, 11:29725 (RA;US)
See Shaughnessy, E.J., 11:29727
Davidson, J.W., Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket, 11:31174 (J;US)
See Copenhaver, C., 11:31175
Davidson, R.C., *See* Conn, R.W., 11:31009
Davidson, W.M., *See* Moya, M.M., 11:29823
Davie, R.F., *See* Byrne, A.P., 11:30922
Davies, P.G., Wave energy. The Department of Energy's R and D programme 1974-1983, 11:29643 (R;GB)
Davis, C.C., *See* Fife, K.W., 11:29294
Davis, J., *See* Tilack, M., 11:31245
Davis, J. F., *See* Spicer, L. D., 11:30549
Davis, J.P., *See* Chan, D.W., 11:29364
Davis, J.W., Structural materials data base assessment for the Blanket Comparison and Selection Study, 11:31100 (J;US)
See Spitznagel, J.A., 11:31035
Davis, L.G., *See* Luxon, J.L., 11:31119
Davis, R.H., *See* Clements, J.S., 11:29693
Davis, W.A., *See* Glowienka, J.C., 11:31013
Davis, W.T., Spray dryer/baghouse experiences on a 1000 ACFM pilot plant, 11:29731 (RA;US)
Dawson, J., Soudan 2 data acquisition and trigger electronics, 11:30448 (J;US)
Dawson, S.A., *See* Allen, C.R., 11:30340
Day, A.C., Burst annealing of electron damage in silicon solar cells, 11:29529 (RA;US)
Day, D., *See* Mann, W.A., 11:30824
Day, M.J., Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
De Boer, T.C., Heat transfer to a dispersed two phase flow and detailed quench front velocity research, 11:29836 (R;FR)
de Bouard, G., Search of prompt electrons in the NA14 photoproduction experiment at the CERN, 11:30836 (R;FR;In French)
de Buzonniere, A., SETH 200: new mobile unit for spent ion-exchange resins embedding in polymers, 11:29343 (RA;US)
De Jonghe, L.C., Solid electrolyte for high energy density batteries, 11:29902 (R;US)
De Kinder, R.E. Jr., *See* Zardecki, A., 11:30948
de la Moriniere, O., Attractive economics of thermal storage in new buildings, 11:29976 (RA;US)
de Pena, R.G., *See* Lewin, E.E., 11:30546
de Rosa, C., *See* Basso, M., 11:29594
De Van, J.H., *See* Moir, R.W., 11:31103
de Winter, F., Solar collectors for building applications, 11:29587 (RA;US)
Deadrick, F.J., *See* Miller, E.K., 11:31288
Dean, P.N., *See* Griffith, R.V., 11:30951
Dean, W.E., *See* Tuttle, M.L., 11:29287
Deason, V.A., Diffraction moire of dynamic events, 11:30383 (R;US)
Deb, S.K., Status of photovoltaics R & D at SERI, 11:29548 (BA;US)
DeBoo, J.C., *See* Schissel, D.P., 11:31069
Debrodt, D.C., *See* Hutchinson, R.A., 11:29919
Debus, G.H., Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
DeGeorge, V.V., Fabrication and loading of fuel rods for the Light Water Breeder Reactor (LWBR Development Program), 11:29781 (R;US)
Dehmer, J.L., *See* Pratt, S.T., 11:30293
Dehmer, P.M., *See* Pratt, S.T., 11:30293
Deis, G., *See* Myers, B., 11:30407
See Tilack, M., 11:31245
Deis, G.A., Utilization of fission reactors for fusion engineering testing, 11:31247 (J;US)
Del Duca, A., *See* Patt, B.E., 11:30667
Del Guerra, A., *See* Fujieda, I., 11:30461
Del Vasto, M., *See* Kaifer, R.C., 11:30432
DeLaive, P.J., *See* Brunschwig, B.S., 11:30292
Delaney, R.C., *See* Miller, W.R., 11:29154
Deleens, E., Temperature dependence of carbon isotope fractionation in CAM plants, 11:30677 (J;US)
Delegard, C.H., Characterization and anion exchange removal of uranium from Hanford ground water, 11:30616 (R;US)
Delene, J.G., An economic analysis of fusion breeders, 11:31120 (J;US)
See Krakowski, R.A., 11:31076
See Sheffield, J., 11:31085
DelFabbro, R., *See* Bedeschi, F., 11:30446
Delhelj, P.P.J., *See* Wait, G.D., 11:30417
Dell'Orso, M., *See* Bedeschi, F., 11:30446
DellaCorte, C., Composition optimization of self-lubricating chromium carbide-based composite coatings for use to 760°C, 11:30091 (R;US)
Demain, A. L., *See* Johnson, E. A., 11:30267
Dembo, M., *See* MacGlashan, D.W. Jr., 11:30626
Demuth, O.J., Supercritical binary geothermal cycle experiments with mixed-hydrocarbon working fluids and a vertical, in-tube, counterflow condenser, 11:29629 (R;US)
See Bliem, C.J., 11:29913
Denison, L.S., Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Denison, R.E., *See* Hinze, W.J., 11:29622
Dennis, A.W., Operational procedures for receiving, packaging, emplacing, and retrieving high-level and transuranic waste in a geologic repository in tuff, 11:29417 (R;US)
Dennis, B.R., Earth science instrumentation update review FY1985, 11:29634 (RA;US)
See Emslie, A.G., 11:30788
Denniston, C., *See* Abrahamson, S., 11:29449
Denny, M.D., *See* Vergino, E.S., 11:30518
Derrick, M., *See* Mann, W.A., 11:30824
Deruaz, R., Study of two-dimensional effects in the core of a light water reactor during the ECC'S phase following a loss of coolant accident, 11:29837 (R;FR)
Desalvo, G.C., N/P GaAs concentrator solar cells with an improved grid and buahbar contact design, 11:29520 (RA;US)
Desbordes, D., *See* Brossard, J., 11:29798
Deschamps, G.A., Comparison of Clifford and Grassmann algebras in applications to electromagnetics. Revision 1, 11:30959 (R;US)
Descroix, E., *See* Bachelier, D., 11:30905
Desrosiers, M.F., Structure and dynamics of olefin radical cation aggregates. Time-resolved fluorescence detected magnetic resonance, 11:30301 (J;US)
DeVan, J.H., *See* Chopra, O.K., 11:31098
See Moir, R.W., 11:31143
See Tortorelli, P.F., 11:31037, 11:31038
Devaney, H.F., Multiple-stage integrating accelerometer, 11:30501 (P;US)
Deville-Cavelin, G., *See* Crabol, B., 11:30559
Devkota, G.P., Socio-economic impacts of community biogas plants in Nepal, 11:29474 (RA;DE)
DeVoe, I.W., *See* Greer, C.W., 11:29357
Devol, A.H., *See* Hedges, J.I., 11:30605
Devoto, R.S., Heating and pumping studies in the end cells of tandem-mirror reactors, 11:31011 (BA;US)
See Perkins, L.J., 11:31168
DeVries, R.M., *See* Kapustinsky, J.S., 11:30489
See Sunier, J.W., 11:30490
DeWald, A.B., *See* Brooks, J.N., 11:31163
See Krauss, A.R., 11:31236
Dhawan, S., *See* Coutrakon, G.B., 11:30456
Dhawan, S.K., Introduction to semi-custom integrated circuits, 11:30436 (J;US)
Di Fabio, N., *See* Brossard, J., 11:29798
Di Marco, J.N., *See* Massey, R.S., 11:31177

Di Nardo, R.P., *See* Beuttenmuller, R., 11:30423
Di Netta, L.C., *See* Birkmire, R.W., 11:29550
Dialetis, D., *See* Fliflet, A.W., 11:31270
Dickson, R.L., Radiation exposure rates and radionuclide concentrations in soil around the Argonne National Laboratory-West Site, 11:30581 (R;US)
Diebold, G.J., *See* O'Connor, M.T., 11:30294
Dienes, J.K., Foundations of statistical crack mechanics, 11:30958 (R;US)
Diercks, D.R., Environmental effects on the properties of vanadium-base alloys, 11:31041 (RA;US)
Dietderich, D.R., Relationship between critical current and microstructure of internal tin wire, 11:30342 (R;US)
Dietrich, K., Excitations in grazing heavy ion reactions, 11:30931 (R;FR)
Dietzer, G.F., *See* Zeiger, E., 11:30680
Difilippo, F.C., *See* Smith, O.L., 11:29858
DiGiacomo, N.J., *See* Kapustinsky, J.S., 11:30489
See Sunier, J.W., 11:30490
Dillmann, C.W., Design of a modular radwaste facility, 11:29355 (RA;US)
Dillon, K.L., *See* Law, A.G., 11:30617
DiLorio, G., *See* Bennett, E.F., 11:31157
Dimonte, G., *See* Molvik, A.W., 11:30985
Dincklage, R.-D. von, On the electron capture decay energies of ^{153}Gd and ^{175}Hf, 11:30917 (R;AU)
Dincklage, R.D. von, Electron capture decay of ^{149}Tb, 11:30915 (R;AU)
Dinegar, R.H., Radial buildup to detonation in pentaerythritol tetranitrate (PETN), 11:30514 (R;US)
Dinerstein, H.L., *See* Lester, D.F., 11:30784
Dineykhan, M., Low-energy hadron physics in the virton quark model, 11:30857 (R;XA)
Dingeldein, H., *See* Stephan, B., 11:29463
Dion, L., Study of the hydridation of an uranium alloy containing 0.2 weight percent of vanadium, 11:30073 (R;FR;In French)
Dischler, S.A., *See* Kim, K., 11:29415
DiSibio, R., *See* Mallory, C.W., 11:29336, 11:29342
Dismukes, E.B., Pilot-scale study of a new method of flue-gas conditioning with ammonium sulfate, 11:29703 (RA;US)
Divakaruni, S.M., *See* Loewenstein, W.B., 11:29868
DiVirgilio, A., *See* Bedeschi, F., 11:30446
Dixit, S.N., *See* Mazumdar, S., 11:30269
Dixon, D.F., *See* Hardy, D.G., 11:29324
Dixon, R.S., Canadian Nuclear Fuel Waste Management Program. 1983 annual report, 11:29309 (R;CA)
Djebara, M., *See* Ashgar, M., 11:30924
Doan, T.P., *See* Sicre, A., 11:30927
Dockter, L., Underground coal gasification: environmental update, 11:29171 (B;US)
Doctor, R.D., *See* Garvey, D.B., 11:29214
Dod, R.L., Size fractionation of black and organic particulate carbon from fires. Final report, 11:30537 (R;US)
Doe, B.R., *See* Youngdahl, C.A., 11:30526
Doerr, W.W., *See* Shiao, S.Y., 11:30174
Doggett, J.N., *See* Henning, C.D., 11:31123
See Nelson, W.D., 11:31129
Dole, L.R., Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)
Dolin, R., *See* Patt, B.E., 11:30667
Domahidy, G., *See* Eitel, G.L., 11:29272
Doman, J.W., *See* McKinnon, M.A., 11:29303
Dominguez, R.R., Non-ideal ballooning modes in a tokamak, 11:30993 (J;AT)
Donaubauer, E., Comparison of the methods of survey adopted in the Federal Republic of Germany and Austria, 11:30713 (RA;DE;In German)
Current state of forest decline in Central Europe, 11:30711 (RA;DE;In German)
Donohue, D.L., Removal of isobaric interferences by resonance ionization mass spectrometry, 11:30188 (J;US)
Dorfman, M.H., Overview of geopressured-geothermal research, 11:29915 (RA;US)
Dorgham, M.A., Technological advances in vehicle design: Ford energy report, 11:30047 (B;GB)
Technological advances in vehicle design: electric and hybrid vehicles, 11:30064 (B;GB)
Doriath, J.Y., *See* Mourgues, A., 11:29794
Dorning, J.J., *See* Hertel N.E., 11:31091
Dory, R.A., *See* Sheffield, J., 11:31085
Doty, G.C., Inflow to a crack in playa deposits of Yucca Lake, Nevada Test Site, Nye County, Nevada, 11:30745 (R;US)
Doty, K.G., A case study of the effects of local and distant sources of alkaline material on precipitation in the midwest and plains, 11:30550 (J;US)
Dougherty, D.R., *See* Siskind, B., 11:30079
Doughty, C., Heat pipe effects in nuclear waste isolation: a review, 11:29405 (R;US)
Douglass, R.J., Algorithms + Alchemy = Architectures, 11:31290 (BA;US)
Dowgiallo, E.J., Examination of battery-related electric vehicle track and field measurements, 11:30058 (RA;US)
See Hardin, J.E., 11:30051
Dowgiallo, E.J. Jr., Innovative on-board instrumentation for EV battery characterization, 11:30055 (RA;US)
Downing, J.N., *See* Massey, R.S., 11:31177
Dracoulis, G.D., *See* Byrne, A.P., 11:30922
See Gerl, J., 11:30916
See Leigh, J.R., 11:30914
See Poletti, A.R., 11:30920
See Poletti, S.J., 11:30921
Drake, G., A large dynamic range charge amplifier ADC for the Fermilab collider detector facility, 11:30468 (J;US)
The Rabbit system: Low cost, high reliability front end electronics featuring 16 bit dynamic range, 11:30447 (J;US)
Dreesen, D.S., Open hole packer and running procedure for Hot Dry Rock reservoir testing, 11:29633 (RA;US)
Drenker, S., *See* Ciliberti, D.R., 11:29688
Drenker, S.G., *See* Lippert, T.E., 11:29687
Drennon, B.J., *See* Nyhan, J.W., 11:30618
Dresner, L., *See* Lue, J.W., 11:31171
Drickamer, H.G., *See* Clark, F.T., 11:30249
Driggers, G.W., *See* Altman, R.F., 11:29717
Droege, A.T., *See* Tully, F.P., 11:30251
Droege, T.F., *See* Drake, G., 11:30447, 11:30468
Drummond, T.J., Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Druschel, R.E., *See* McKee, R.A., 11:30227
Dryer, M., *See* Harrison, R.A., 11:30789
Du, C., The history and future of China's oil shale industry, 11:29940 (BA;US)
DuBard, J.L., Aerosol particle charging in a pulsed corona discharge, 11:29715 (RA;US)
Analysis of error in precipitator performance estimates, 11:29697 (RA;US)
See Altman, R.F., 11:29717
See Faulkner, M.G., 11:29696
See Landham, E.C. Jr., 11:29714
See Young, R.P., 11:29720
Dubnickova, A.Z., *See* Dineykhan, M., 11:30857
DuBois, M.R., *See* Rajan, O.A., 11:30280
Dubois, R., SLD liquid argon calorimeter prototype test results, 11:30455 (J;US)
Duchene, J., In-core measurements with platinum self powered detectors in a French PWR, 11:29756 (R;FR)
Dudley, I.T., *See* Conlin, J.A., 11:31044
Dudziak, D.J., *See* Davidson, J.W., 11:31174
Duerrfeld, H., Progress in circulating fluidized bed firing for steam generation and use of low value fuels and coals, 11:29218 (R;FR;In German)
Duggin, B.W., *See* Cowan, M., 11:30352
Dulla, R., *See* McNutt, B.D., 11:30044
Dumont, A., *See* Bordes, P., 11:29758
Dumont, J.N., Egg envelopes in vertebrates, 11:30672 (J;US)
Dunaway, P.B., *See* Dahlman, R.C., 11:30701
Duncan, M.W., Pilot demonstration of air curtain control of buoyant fugitive emissions, 11:30529 (RA;US)
Duncumb, W.R., Spacecraft orbital power evaluation (SCOPE), 11:30396 (RA;FR)
Dunford, W.G., *See* Liu, G., 11:29511
Dunlavy, D.J., *See* Abou-Elfotouh, F., 11:29552
Dunlop, W., *See* Jensen, R.M., 11:29195
Dunn, J. C., Convective heat flow probe, 11:29624 (P;US)
Dunn, J.C., Magma energy and geothermal permeability enhancement programs, 11:29641 (RA;US)
Dunning, T.H. Jr., Theoretical studies of the energetics and mechanisms of chemical reactions: abstraction reactions, 11:30206 (J;US)
Dupuis, L.R., *See* Lipfert, F.W., 11:30552
Duran, B.S., *See* Martz, H.F., 11:29876
Durham, C.O. Jr., Sweet Lake geopressured-geothermal project, Magma Gulf-Technadril/DOE Amoco fee. Volume III. Final report. Annual report, February 1982-March 1985, 11:29638 (R;US)
Durham, M., Field study of multi-stage electrostatic precipitators, 11:29711 (RA;US)
See Rinard, G., 11:29712
See Rugg, D.E., 11:29686
Durrani, T.M., Solar energy policies and the role of human settlements planner, 11:29583 (RA;US)
Durrett, L.R., *See* Matty, J.M., 11:29636

Dursch, H., Photon radiation effects on CdS/CuInSe2 thin film solar cells, 11:29533 (RA;US)
Dutta, S.K., Nuclear and organelle split genes, 11:30648 (BA;IN)
DuVal, D.L., Selectivity variations in anion chromatography, 11:30184 (D;US)
Dwyer, R., Plastic scintillator response to relativistic nuclei, Z<=28, 11:30484 (J;NL)
Dyni, J.R., Fluorine in Colorado oil shale, 11:29276 (BA;US)

E

Eades, R.A., *See* Dunning, T.H. Jr., 11:30206
Eagleston, D., Trends in post-mining land uses - are we doing our children justice?, 11:29190 (RA;US)
Earl, W.L., *See* Engelke, R., 11:30515
Eastwell, A.S., Heat metering for domestic premises, 11:29994 (R;GB)
Eaton, J., Evaluating environmental exposure through innovative biological tests, 11:30597 (RA;US)
Eaton R. III, *See* Broach, J.T., 11:30355
Ebeling, N., Solidification of enriched tritium from reprocessing, 11:29402 (R;DE;In German)
Eberhard, B.A., *See* Edwards, G.R., 11:31234
Eberts, K., Quality test of lead accumulators, especially of maintenance-free, sealed lead batteries with immobilized electrolyte, 11:29891 (RA;US)
Echavarria-Heras, H., *See* Wofsy, C., 11:30636
Eck, G., Design of the thermal management systems for NaS-traction-batteries by using battery models, 11:30056 (RA;US)
See Geilert, U., 11:29889
Eckert, C.A., Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)
Eckert, H.J., *See* Park, Y.M., 11:29301
Eckert, J., *See* Robinson, R.A., 11:30486
Eckhardt, C.J., *See* Bernstein, J., 11:30241
Eder, D.C., *See* Valeo, E.J., 11:30979
Edgar, R.M., *See* Holmes, J.T., 11:30134
Edmondson, W.T., Control of productivity and population characteristics in aquatic communities. Progress report, 1 September 1982-31 August 1983, 11:30594 (R;US)
Edwards, G.R., Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Edwards, P.G., Preparation of tetraalkyl phosphine complexes of the *f*-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Efimov, G.V., *See* Dineykhan, M., 11:30857
Efthimion, P., TFTR plasma feedback systems, 11:31004 (J;US)
Egan, L.G. Jr., Analysis of the certification process of computer programs used in a nuclear power plant, using the management systems approach, 11:29846 (R;US)
Ege, S.N., *See* Reichel, L.W., 11:30298
Eggenberger, A., Thermal measurements in greenhouses attached to residential buildings. Climatic conditions - occupants - thermal comfort, 11:30013 (R;DE;In German)
Eggersgluess, H., *See* Kopiske, G., 11:29479
Eguchi, K., Basic computer code for industrial burner designs. Part 1: capability test in isothermal swirling flows, 11:30326 (RA;JP)
Ehst, D.A., A comparison of burn cycle options for Tokamak reactors, 11:31197 (J;US)
See Brooks, J.N., 11:31161
Eichler, J.P.F., *See* Barros, S. de, 11:30928
Eigen, G., *See* Dubois, R., 11:30455
Eisen, Y., *See* Baird, W., 11:30434
Eisenhauer, J.L., *See* Hutchinson, R.A., 11:29919
Eisenberg, D.M., Nuclear plant aging research program activities, 11:29833 (R;US)
See Crowley, J.L., 11:29802
Eitel, G.L., Update on the American Syn-Crude/Indiana Shale Oil Project, 11:29272 (BA;US)
Ejima, S., *See* Kahn, C., 11:30989
Ek, R., *See* Greer, C.W., 11:29357
Eklund, J.D., *See* Badalamente, R.V., 11:29852
El-Afify, M., *See* Svintoslavsky, I.N., 11:31151
El Diasty, R., Effect of wall geometry on net heat gain or loss, 11:30009 (RA;US)
El-Genk, M.S., Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
El-Guebaly, A., Materials problems for highly irradiated ICRH Launchers in fusion reactors, 11:31195 (J;US)
El-Guebaly, L.A., Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)
End cell shielding and streaming analysis of MARS tandem mirror reactor, 11:31147 (J;US)
El-Gueraly, L.A., *See* Nagy, M.E., 11:30944
El Halwagi, M.M., Pilot experiment for cooperative community biogas facilities in rural Egypt indicated social failure, 11:29470 (RA;DE)
El-Kady, A.A., *See* Hussein, A.Z., 11:30507
El-Mulki, H., *See* Taani, R., 11:29599
Elder, R.C., Structure of trichloro(diethylenetriamine)gold(II), $Au(dien)Cl_3$, determined by single-crystal x-ray diffraction, Raman, and EXAFS spectroscopies: an EXAFS caveat, 11:30254 (J;US)
Elder, R.E., Remedial waste management practices resulting in the decline of airborne plutonium adjacent to a liquid waste disposal ditch at the Hanford site, 11:29435 (RA;US)
Elliot, G., DTI support for commercial wind turbines, 11:29650 (RA;GB)
Elliott, D., *See* McNutt, B.D., 11:30044
Ellis, J.F., *See* Fietz, W.A., 11:31170
Ellis, J.S., Constructing a coherent long-term global total ozone climatology from the BUV, MFR, and SBUV/TOMS data sets, 11:30810 (R;US)
Elmore, M.R., Evaluation of chemical stabilizers and windscreens for wind erosion control of uranium mill tailings, 11:30557 (RA;US)
Eloranta, E.W., *See* Boers, R., 11:30523
Elsayed, M.M., Simulation and optimization of design parameters of solar-operated absorption cooling machine, 11:29572 (RA;US)
Simulation of a two-stage solar-operated absorption cooling system, 11:29588 (RA;US)
Elwood, J.W., Periphyton production and grazing rates in a stream measured with a ^{32}P material balance method, 11:30606 (J;DK)
Emanuel, W.R., Climatic change and the broad-scale distribution of terrestrial ecosystem complexes, 11:30572 (J;NL)
Embrey, D.E., *See* Rosa, E.A., 11:29853
Embury, M.C., Low temperature distillation system for tritium recovery, 11:29406 (RA;US)
Emerson, R.D., *See* McLaughlin, B.R., 11:29732
Emge, T.J., New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)_2X$ salts ($X = ICl_2\pi$ and $BrICl^-$), 11:30245 (J;US)
Emr, A., *See* Guber, W., 11:29356
Emslie, A.G., Excitation of the iron Kα feature in solar flares, 11:30788 (R;GB)
Endres, G.W.R., *See* Brackenbush, L.W., 11:30440
Engelhard, M.P., Estimates of secondary waste production from operations at a proespective geologic repository in tuff, 11:29393 (RA;US)
Engelke, R., Production of the nitromethane aci ion by UV irradiation: its effect on detonation sensitivity, 11:30515 (J;US)
England, A.W., *See* Bredehoeft, J.D., 11:29401
Engleman, R. Jr., *See* Palmer, B.A., 11:30321
English, A.M., *See* Brunschwig, B.S., 11:30292
Ensberg, E.S., *See* Thomas, D.M., 11:31014
Ensor, D.D., *See* Young, J.P., 11:29426
Ensor, D.S., Prediction of plume opacity from stationary sources, 11:30528 (RA;US)
See Viner, A.S., 11:29691
Entingh, D.J., Federal geothermal technology transfer activities, 11:29626 (RA;US)
Epstein, J.E., *See* Deason, V.A., 11:30383
Erck, R.A., Radiation-induced segregation and precipitation in molybdenum-rhenium alloys, 11:30083 (R;US)
Erickson, R., *See* Massey, R.S., 11:31177
Erkloe, E., Energy economical pilot projects in building industry, 11:29997 (R;FI;In Finnish)
Ermi, A.M., FFTF fusion irradiations - FFTF cycles 4-6, 11:31045 (RA;US)
Ernstsson, G., Research project District Heating, 11:29918 (R;SE;In Swedish)
Errico, S., *See* Theodore, L., 11:29745

Ertel, J.R., *See* Hedges, J.I., 11:30605
Esat, M.T., *See* Fewell, M.P., 11:30910, 11:30919
Esmaili, E., Assessing potential trace metal leachability of retorted oil shale by complexometric agents, 11:29286 (BA;US)
Espenson, J.H., *See* Bakac, A., 11:30246, 11:30247
Essling, M.A., *See* Toohey, R.E., 11:30556
Estand, E., Introduction to Weibull analysis, 11:29901 (RA;US)
Esten, M.J., *See* Beuttenmuller, R., 11:30423
Eubank, H.P., *See* Williams, M.D., 11:31198
Evangelou, V.P., Factors and treatment of abandoned acid mine lands for controlling nonpoint source pollution, 11:29192 (RA;US)
Evans, J.C., *See* Olsen, K.B., 11:30224
Evans, K., *See* Ehst, D.A., 11:31197
See Turner, L.R., 11:31164
Evans, N.J.,II, *See* Lester, D.F., 11:30784
Ewing, K.C., *See* Jacob, N.P., 11:29392
Ewing, R.C., *See* Jantzen, C.M., 11:29428
Exarhos, G.J., *See* Hsu, L.S., 11:30136
Eyman, L.D., DOE hazardous waste management program, 11:29330 (RA;US)

F

Faas, S.E., Evaluation of heliostat field/receiver configurations, 11:29609 (R;US)
Fabjan, C.W., *See* Batley, R., 11:30485
Fagundes, H.V., Multiple images of our galaxy in closed, multiply connected cosmologies, 11:30770 (R;BR)
Fahlander, C., *See* Byrne, A.P., 11:30922
Failing, K.H., *See* Duerrfeld, H., 11:29218
Fair, C.K., *See* Bruno, J.W., 11:30318
Fairbairn, S.A., Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 1, 11:29840 (R;FR)
Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 2, 11:29841 (R;FR)
Fairbanks, E., *See* Kahn, C., 11:30989
Fairchild, R.G., *See* Slatkin, D.N., 11:30658
Fairclough, J.H., Infrared photometric properties of the average galaxy, 11:30794 (RA;GB)
Fajer, J., *See* Horning, T.L., 11:30625
Fajer, R., *See* Senum, G.I., 11:30256
Falabella, S., *See* Molvik, A.W., 11:30985
Falconer, K.L., *See* Nishimoto, D.D., 11:29334
Faltens, A., *See* Hovingh, J., 11:30409
Farahat, A.M., Efficient utilization of energy in the growth of existing campuses, 11:30007 (RA;US)
Farber, P.S., *See* Garvey, D.B., 11:29214
Farrar, C.D., *See* Sorey, M.L., 11:30747
Farrell, K., Ion damage microstructures in a Fe-10Cr-6Mo-0.5Nb ferritic steel, 11:30087 (R;US)
Farrington, J., *See* Hunt, J., 11:29231
Farshchi, M., Prediction of heat release effects on a mixing layer, 11:30327 (BA;US)
Farwell, G.W., *See* Hedges, J.I., 11:30605
Fasolo, J., *See* Hong, R., 11:31207
Fassbender, L.L., *See* Brown, D.R., 11:29601
Faulkner, M.G., Microcomputer programs for precipitator performance estimates, 11:29696 (RA;US)
Fecht, B.A., *See* Badalamente, R.V., 11:29852
Federer, J.I., Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)
Fedors, J.C., *See* Watson, N.D., 11:30426
Fedro, A.J., Theory of elementary excitations in intermediate valence materials, 11:30954 (BA;US)
Fee, D.S., Fusion reactor and test cell configuration, 11:31109 (J;US)
Feldman, B.F., *See* Yates, R.W., 11:30673
Feldman, G., *See* Bernstein, D., 11:30445
Feldman, P.L., High-temperature, high-pressure electrostatic precipitation, current status, 11:29685 (RA;US)
Felker, L.K., *See* Toth, L.M., 11:30313
Fellows, R.L., *See* Benker, D.E., 11:29292
Felton, J.S., *See* Hatch, F.T., 11:30726
Feng, Q., Surface-enhanced resonance Raman study of the photoreduction of methylviologen on a p-InP semiconductor electrode, 11:30285 (J;US)
Feng Xiaoshan, *See* Qian Zeshu, 11:29469
Fenimore, E.E., *See* Laros, J.G., 11:30787
Fenstermacher, M.E., Modeling and optimization of a test-cell upgrade for MFTF-B operating in the high neutron wall loading mode, 11:31188 (J;US)
Plasma engineering models of tandem mirror devices with high-field test-cell inserts, 11:30996 (J;US)
See Haney, S.W., 11:31130
Fergus, R.W., Stack monitor for the proof-of-breeding project, 11:30431 (J;US)
Ferguson, S.W., *See* Molvik, A.W., 11:30985
Fernandes, N.C., *See* Cattani, M.S.D., 11:30863
Fernandez, A.M., *See* Sperling, L.H., 11:30146
Ferrara, V., *See* Cagnetti, P., 11:30558
Ferreira, C.M., Electron energy distributions and excitation rates in high-frequency argon discharges, 11:30977 (R;FR)
Ferrell, T.L., *See* Bloemer, M.J., 11:30393
See Little, J.W., 11:30115
Fessenden, R.W., Measurement of the dipole moment of a peroxyl radical by microwave dielectric absorption, 11:30274 (J;US)
See Kamat, P.V., 11:30284
Fewell, M.P., Determination of $B(E3;0_1^+ \rightarrow 3_1)$ values for the stable isotopes of cadmium, 11:30910 (R;AU)
Quadrupole moment of ^{196}Pt - a crucial test of nuclear models, 11:30919 (R;AU)
Fidone, I., *See* Mazzucato, E., 11:30988
Fiebig, R., *See* Wambach, J., 11:30923
Fields, D.E., Local transport of vertically- and horizontally-emitted sodium oxide aerosols, 11:29778 (R;US)
Fields, L.W., International Atomic Energy Agency UF_6 cascade header pipe test loop: safety assessment, 11:29453 (R;US)
Fietz, W.A., Experience with operation of a large magnet system in the international fusion superconducting magnet test facility, 11:31170 (J;US)
Fieux, B., Computer analysis tool for evaluation of solar array design, 11:29512 (RA;FR)
MATPWR: a mission analysis tool for LEO spacecraft power profiles computation, 11:30397 (RA;FR)
Fife, K.W., Regeneration and recycle of spent oxide reduction solvent salts used in pyrochemical plutonium recovery operations at Los Alamos, 11:29294 (R;US)
Fikani, M.M., *See* Laros, J.G., 11:30787
Filippi, A., *See* Theodore, L., 11:29745
Finch, C.B., Crystal growth and properties of trinickel boride, Ni_3B, 11:30140 (J;NL)
Findl, E., Fuel cell having dual electrode anode or cathode, 11:29904 (P;US)
Fink, J.H., Cesium transpiration through a negative-ion forming electrode, 11:31266 (BA;US)
Finkel, B., Electronic mail at ANL. Revision, 11:31276 (R;US)
Finn, P.A., A systematic methodology for estimating direct capital costs for blanket tritium processing systems, 11:31145 (J;US)
Tritium system design for the mirror reactors FPD-I, FPD-II, and FPD-III, 11:31203 (J;US)
Tritium technology review, 11:31196 (J;US)
See Sumpinato, P.T., 11:31131
Finnerty, W.R., Microbial biosurfactant - physiology, biochemistry, and applications, 11:29247 (J;US)
Fiot, M., *See* Dion, L., 11:30073
Firriolo, J.M., Determination of cobalt in samples containing cobalt and tungsten carbide by electrothermal atomic absorption spectrometry, 11:30548 (J;US)
Fischer, A.K., Thermochemical comparison of the effectiveness of protium purging of fusion breeders, 11:31142 (J;US)
See Liu, Y.Y., 11:31097
Fischer, E., *See* Wismontski-Knittel, T., 11:30276
Fischer, H.D., *See* Buttener, W.E., 11:29871
Fischer, J., Position detection of 17-25 keV x-rays in krypton and xenon with a resolution of 18-50μm (FWHM), 11:30459 (J;US)
X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 11:30422 (R;US)
Fischer, R., Dislocation reduction in epitaxial GaAs on Si (100), 11:30165 (J;US)
Fisher, J.C., *See* Griffith, R.V., 11:30951
Fisher, R.K., *See* Hopkins, G.R., 11:31002
Fisk, Z., *See* Frank, K.H., 11:30111
Flanagan, C.A., Compact ignition tokamak design studies: design and analysis listing and examples. Documentation listing, 11:31068 (R;US)
Technical benefit of an international project, 11:31126 (J;US)
Flanders, B., *See* Moffa, P., 11:31012
Fleischer, C.C., Study of explosive demolition techniques for heavy

reinforced and prestressed concrete structures, 11:29835 (R;FR)
Fletcher, J.S., *See* Achhireddy, N.R., 11:30641, 11:30656
Fliflet, A., *See* Park, S.Y., 11:31269
Fliflet, A.W., Invited paper: high power gyrotrons for fusion applications, 11:31270 (BA;US)
Flint, J.H., *See* Kipouros, G.J., 11:30217
Floersch, R.H., Microprocessor controller for mold heating and cooling. Final report, 11:30391 (R;US)
Flower, P.S., *See* Apsimon, R.J., 11:30450
Fly, G.W., *See* Anderson, C.A., 11:30162
Flynn, G.W., *See* Brady, B.B., 11:30290
Focardi, E., *See* Bedeschi, F., 11:30446
Fogler, H.S., Improving the stability of coal slurries. Quarterly and half-yearly report, September 15-December 15, 1985 and September 15, 1985-March 15, 1986, 11:29206 (R;US)
Foley, J.V., *See* Jung, J., 11:31095
Folz, D., *See* Jensen, R.M., 11:29195
Fontaine, J.M., *See* Dion, L., 11:30073
Fontaine, J.P., Ten years of sodium cooled steam generator tests on the C.G.V.S. Synthesis of the results obtained on these equipments and operation experiments of an industrial size test facility, 11:29780 (R;FR;In French)
Fonvieille, H., Pion electroproduction at threshold in the inverse channel: $\pi p \rightarrow n e^+ e$. Determination method of the longitudinal multipole Lsub(0+)sup(π) at small transfer. Preparation of the experiment, 11:30842 (R;FR;In French)
Fooks, C.J.R., *See* Stephenson, L., 11:29273
Foote, G.S., *See* Leigh, J.R., 11:30914
Foote, J.H., *See* Grubb, D.P., 11:31082
Forck, B., Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
Ford, C.W., *See* Werthen, J.G., 11:29521
Ford, P.J., *See* Allen, A.M.T., 11:30158
Forden, G.E., Lifetime measurements of hadrons containing heavy quarks at PETRA and PEP, 11:30843 (R;GB)
Fore, C.S., *See* Joy, D.S., 11:29308
Forest, C.A., *See* Tang, P.K., 11:30512
Fornes, R.E., Effects of high energy radiation on the mechanical properties of epoxy-graphite fiber reinforced composites. Interim report, 1 January-31 December 1985, 11:30145 (R;US)
Forrest, R.A., *See* Alper, B., 11:29566
Forsberg, C.W., Data processing in the integrated data base for spent fuel and radioactive waste, 11:29421 (BA;US)
Forsha, M.D., *See* Parker, T.E., 11:30033
Fortier, S., *See* Azaiez, F., 11:30911
Fossum, A.F., *See* Munson, D.E., 11:30752
Foster, W., *See* Yarema, R.J., 11:30471
Foucher, C., *See* Alamo, A., 11:30072, 11:30076
Fouilleul, R., *See* Philippot, J., 11:29806
Fouquet, D., Electricity in the service sector of France, 11:29953 (RA;US)
Foushee, F., *See* El-Genk, M.S., 11:29864
Foushee, F.C., *See* El-Genk, M.S., 11:29863
Fowler, T.K., *See* Conn, R.W., 11:31009
Fox, M.A., Use of organic molecules as mechanistic probes for semiconductor-mediated photoelectrochemical oxidations: bromide oxidation, 11:30265 (J;US)
Fraas, L.M., *See* Partain, L.D., 11:29524
Francis, R.W., Two years of on-orbit gallium arsenide performance from the LIPS solar cell panel experiment, 11:29537 (RA;US)
See Janousek, B.K., 11:29540
Francocci, G.F., Probabilistic analysis of the events: loss of electric power supply of the secondary coolant circuit pump related to the busbar AL1 AL2 and loss of power supply of the busbar ML1 ML2 of the primary coolant circuit of the SORA reactor, 11:29819 (R;FR;In Italian)
Frank, J.S., *See* Bolton, R.D., 11:30491
Frank, K.H., Bulk and surface valence of $YbBe_{13}$, 11:30111 (J;CH)
Frank, M.L., *See* Witkamp, M., 11:30588
Franzen, H.F., Calculated electron density distributions in ScS and Sc_3S_4, 11:30205 (J;US)
Freedman, S.J., *See* Gagliardi, C., 11:30904
Freeston, K.A., *See* Apsimon, R.J., 11:30450
Freije, S.A., FPD plasma heating systems, 11:31208 (J;US)
Plasma heating systems module for TMRSC, 11:31211 (J;US)
Freiser, B.S., Reactions of metal ions and their clusters in the gas phase using laser ionization: ion cyclotron resonance spectroscopy. Progress report, July 1, 1985-June 30, 1986, 11:30235 (R;US)
Freytag, D.R., Waveform sampler CAMAC module, 11:30444 (J;US)
See Haller, G.M., 11:30457
Fried, S.M., *See* Vandegrift, G.F., 11:30586
Friedman, A.M., *See* Gevertz, D., 11:30699
Friedman, J., *See* Johnson, A.S., 11:30477
Friesel, D.L., *See* Pehl, R.H., 11:30481
Fripp, J.W.W., *See* Richmond, R., 11:29815
Frisch, N.W., Analysis of air heater - fly ash - sulfuric acid vapor interactions, 11:29723 (RA;US)
Fritsch, A.F., Experimental investigation of cobalt-60 accumulation and elimination in Cyprinus carpio (L.), 11:30690 (R;FR;In French)
Fritz, R.J., Sidetone generator flowmeter, 11:30502 (P;US)
Froehlich, G., *See* Unger, H., 11:29243
Fromm, K., *See* Hodge, D.S., 11:29617
Frostenson, J.C., *See* Dennis, A.W., 11:29417
Fry, C.G., Nuclear magnetic resonance studies of amorphous silicon hydrides: proton spin dynamics, 11:30223 (D;US)
Fuchs, F.W., Investigations of three-phase current drives for electric battery cars. Vol. 2. Simulation; theory and results, 11:30063 (R;DE;In German)
See Skudelny, H.C., 11:30062
Fuchs, M.R., *See* Law, A.G., 11:30617
Fuhwara, T., *See* Taki, S., 11:30281
Fujieda, I., Further measurements of electron transmission and avalanche gain in narrow lead glass tubing, 11:30461 (J;US)
Fujii, S., *See* Eguchi, K., 11:30326
Fujioka, M., Electron antineutrino mass from the β-decay of ^3H, 11:30826 (RA;JP)
Fujita, E., *See* Horning, T.L., 11:30625
Fukasawa, Tetsuo, *See* Uetake, Naohito, 11:30153
Fukugita, M., Astrophysical constraints on the monopole abundance, 11:30782 (RA;JP)
Fukushima, N., *See* Masuda, S., 11:29721
Fuller, R.K., Biological and physical inventory of the streams within the Nez Perce Reservation. Synopsis of three years of stream inventory on the Nez Perce Reservation. Final report 1985, 11:30621 (R;US)
Fulton, F.J., *See* Moir, R.W., 11:31143
Funk, V.T., Costs and indices for domestic oil and gas field equipment and production operations, 1985, 11:29245 (R;US)
Furr, J.M., *See* Harper, W.V., 11:30739
Furth, H.P., *See* Conn, R.W., 11:31009

G

Gabriel, T.A., *See* Alsmiller, R.G. Jr., 11:30946
Gadhi, S.M.B., Thermodynamic properties state equations of pure methanol and methanol-LiBr . $ZnBr_2$ solutions used in vapor absorption refrigeration and air-conditioning cycle, 11:29595 (RA;US)
Gaertner, E., Current damage situation in Hesse, 11:30708 (RA;DE;In German)
Gaffney, J.S., *See* Senum, G.I., 11:30256
Gagliardi, C., 0^- to 0^+ beta decay in A = 16, 11:30904 (BA;US)
Galambos, J.D., Neutral pumping rates for a next step tokamak ignition device, 11:31235 (J;US)
System studies of compact ignition tokamaks, 11:31029 (R;US)
Galanto, J.J., *See* Reilly, J.K., 11:29832
Gales, J.M., *See* Bajwa, M.M., 11:29574
Gales, S., *See* Azaiez, F., 11:30911
Gallagher, T.F., Studies of autoionizing states relevant to dielectronic recombination. Progress report, July 1, 1985-June 30, 1986, 11:30812 (R;US)
Galliver, T.W., Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Ganander, H., Full-scale experiments at Maglarp. Sub-project: Loads and strains. Sub-report nr 2: Valuation of measurements during October and November 1983, 11:29665 (R;SE;In Swedish)
Gangel, D.J., *See* Snell, M.K., 11:29454
Gangwer, T., Dewatering of bean and powdered resin at Three Mile Island Unit 1, 11:29370 (RA;US)
Gano, K.A., *See* McKenzie, D.H., 11:29446
Garcia, R., Aeroject fluidized bed volume reduction system operation and licensing, 11:29390 (RA;US)
Gardiner, D.E., *See* Best, W.T., 11:29389
Gardner, R., *See* Ruchti, R., 11:30474

Gardner, W.S., Nitrogen regeneration by the subtropical marine copepod Eucalanus pileatus, 11:30657 (J;GB)
Gari, H., Solar-powered, fuel-assisted Rankine cycle and cooling system: King Abdulaziz University cooling project, 11:29567 (RA;US)
Garlick, G.F.J., Depletion layer recombination effects on the radiation damage hardness of gallium arsenide cells, 11:29535 (RA;US)
Garner, F.A., Swelling behavior of titanium-modified alloys in EBR-II, 11:31054 (RA;US)
See Brager, H.R., 11:30097, 11:31036, 11:31055
See Maziasz, P.J., 11:31048
Garner, J., *See* Gierszewski, P., 11:31158
Garner, J.K., A module for testing a lithium cooled tokamak blanket in a tandem mirror test reactor, 11:31152 (J;US)
See Orient, G.E., 11:31136
Garnier, J.L., *See* Brossard, J., 11:29798
Garvey, D.B., Coal cleaning as an acid rain mitigation strategy: an in-depth examination, 11:29214 (J;US)
Garvey, G.T., *See* Gagliardi, C., 11:30904
Gary, J.H., Eighteenth oil shale symposium, 11:29254 (B;US)
Gatos, H.C., EL2 and related defects in GaAs - challenges and pitfalls, 11:29553 (BA;US)
Gauthier, J.P., Study of crack inititation and propagation in heterogeneous welded joints, 11:30074 (R;FR;In French)
Gawreluk, G.R., *See* Aa, P.J., 11:29709
Gay, R.L., Studies of the volatility of cesium and iodine, 11:30189 (RA;US)
Gazes, S.B., *See* Schmidt, H.R., 11:30482
Gee, J.M., Mechanically-stacked multijunction solar cells, 11:29555 (BA;US)
Geffen, C.A., *See* Treat, R.L., 11:29379
Geidel, G., *See* Caruccio, F.T., 11:29189
Geilert, U., Start-up test for NaS-traction-batteries, 11:29889 (RA;US)
Gelfand, P., Estimating the benefits of SO_2 gas conditioning on the performance of utility precipitators when burning US coals, 11:29690 (RA;US)
Gelles, D.S., Effects of irradiation on low activation ferritic alloys, 11:31062 (RA;US)
Insights into the fracture toughness of martensitic stainless steels using stereoscopic fractographic measurements, 11:30096 (R;US)
Microstructural examination of several commercial alloys neutron irradiated to 100 dpa, 11:31034 (RA;US)
Poisson's ratio measurements for martensitic stainless steels, 11:31065 (RA;US)
See Klueh, R.L., 11:30081
See Korenko, M.K., 11:30107
Genet, M., *See* Blaise, A., 11:30152
Genssler, H., Current damage situation in North-Rhine-Westphalia, 11:30709 (RA;DE;In German)
Geoffroy, C.M., *See* Spitzen, M.B., 11:29551
George, E. V., Q-switched raman laser system, 11:30367 (P;US)
Raman accumulator as fusion laser driver, 11:30504 (P;US)
Gerber, M.A., *See* Schiefelbein, G.F., 11:29486
Gerber, S.B., *See* Loomis, B.A., 11:30084
Gerding, T.J., *See* Vandegrift, G.F., 11:30586
Gerl, J., Spectroscopy of ^{166}W and ^{167}W and alignment effects in very neutron-deficient tungsten nuclei, 11:30916 (R;AU)
See Byrne, A.P., 11:30922
See Poletti, A.R., 11:30920
See Poletti, S.J., 11:30921
Gerlach, T.M., *See* Westrich, H.R., 11:29639
Gerrish, P.F., *See* Holmes, J.T., 11:30134
Gerrity, D.P., *See* Valentini, J.J., 11:30819
Gerstl, S.A.W., *See* Zardecki, A., 11:30948
Gervasi, M., Update of the performance of the Cromby Station fabric filter, 11:29737 (RA;US)
Gevertz, D., Role of potassium-40 in evolutionary mutagenesis, 11:30699 (J;US)
Geyer, B., Radiobiological studies on eggs of the rice weevil (Tribolium confusum) after exposure to heavy primary particles of the cosmic radiation, 11:30693 (R;DE;In German)
Gfeller, R.P., Fermentative metabolism of Chlamydomonas reinhardtii. II. Role of plastoquinone, 11:30653 (J;US)
Ghan, S.J., *See* MacCracken, M.C., 11:30519
Ghazi, M., *See* Gari, H., 11:29567
Ghuezaiel, M.J., Influence of titanium on the tempering structure of austenitic steels, 11:30078 (R;FR;In French)
Giannotti, C., *See* Lee, L.Y.C., 11:30288
Gibbs, D.F., *See* Anderton, M.F., 11:29484
Gibbs, G.E., *See* Colvin, C.M., 11:29407
Gibbs, M., *See* Gfeller, R.P., 11:30653
Gibert, A., *See* Basso, M., 11:29594
Gierszewski, P., Engineering scaling and quantification of the test requirements for fusion nuclear technology, 11:31158 (J;US)
See Taghavi, K., 11:31134
See Tilack, M., 11:31245
Gierszewski, P.J., *See* Orient, G.E., 11:31136
Giesy, J., Use of aquatic microcosms for hazard identification, 11:30611 (RA;US)
Gilbert, E., Late somatic effects, 11:29448 (RA;US)
Gilbert, R.D., *See* Fornes, R.E., 11:30145
Gilbert, T.L., *See* Trevorrow, L.E., 11:29337
Giles, G.E., Comparison of a boundary element and finite element solution of an electrochemical plating problem, 11:30328 (R;US)
Gilleland, J.A., *See* Conn, R.W., 11:31009
Gillespie, C.H., *See* Robinson, W.L., 11:30500
Gilligan, J., *See* Gohar, Y., 11:31135
Ginley, D. S., *See* Baughman, R. J., 11:30172
Ginley, D.S., *See* Shelnutt, J.A., 11:30283
Giordano, S., Monochromatic radio frequency accelerating cavity, 11:30403 (P;US)
Giorgi, A.E., Smolt passage behavior and flow-net relationship in the forebay of John Day Dam. Final report 1985, 11:29494 (R;US)
Giruzzi, G., *See* Mazzucato, E., 11:30988
Giubellino, P., *See* Beuttenmuller, R., 11:30423
Giuffre, M., *See* Kornblith, L. Jr., 11:29365
Glanzman, T., *See* Barklow, T., 11:30462
Glasser, A.H., *See* Bravo-Ortega, A., 11:30962
Gleiser, M., *See* Accetta, F.S., 11:30880
Glish, G.I., *See* Todd, P.J., 11:30277
Glowienka, J.C., Preliminary neutral density measurements in EBT using a diagnostic neutral beam, 11:31013 (BA;US)
Glownia, J. H., Resonantly enhanced method for generation of tunable, coherent vacuum ultraviolet radiation, 11:30369 (P;US)
Gneiting, B.C., *See* Berger, J.D., 11:29306, 11:29307
Gobbi, B., *See* Yoshida, R., 11:30458
Godin, D.P., *See* Shewfelt, R.W.S., 11:30070
Godlewski, M.P., *See* Weizer, V.G., 11:29519
Godsey, T.T., *See* Tallent, O.K., 11:29409
Godtel, D., *See* Yde, C., 11:30590
Godwin, R., Transient absorption of light induced by radiation, 11:30160 (R;US)
Goeltz, R., Report brief. Category: evaluation and modeling, 11:30015 (R;US)
Goerlach, U., *See* Batley, R., 11:30485
Gohar, M.Y., *See* Sumpinato, P.T., 11:31131
Gohar, Y., Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study, 11:31094 (J;US)
MFTF-α+T shield design, 11:31155 (J;US)
Nuclear responses in INTOR plasma stabilization elements, 11:31135 (J;US)
See Cha, Y.S., 11:31105
See Lee, V.D., 11:31150
See Yang, S., 11:31149
See Yung, S., 11:31183
Goldberg, I., *See* DeGeorge, V.V., 11:29781
Goldberg, I.B., *See* Chung, K.E., 11:29184
Goldberg, M., *See* Brunschwig, B.S., 11:30292
Goldblatt, M., *See* Walker, T.E., 11:30278
Goldenberg, A., *See* Pakrasi, H.B., 11:30671
Goldfurb, S., TFTR bakeout system, 11:31209 (J;US)
Goldman, C.A., Measured results of energy conservation retrofits in residential buildings, 11:30004 (R;US)
Goldman, L.H., Dump assembly, 11:30356 (P;US)
Goldner, A., *See* Weeds, J., 11:31206
Goldsmith, P., Array technology and applications, 11:29545 (RA;US)
Goldstein, A., *See* Young, F.C., 11:31268
Goldstein, B., *See* MacGlashan, D.W. Jr., 11:30626
See Wofsy, C., 11:30636
Goldstein, J.C., Gain physics of rf-linac-driven xuv free-electron lasers, 11:30363 (R;US)
Goldstein, S.A., *See* Boller, J.R., 11:31265
See Ottinger, P.F., 11:31020
Goldstick, R., *See* Taback, H., 11:29279
Goldston, R.J., *See* Mikkelsen, D.R., 11:31008
Gonar, Y., Neutronics activities for next generation devices, 11:31244 (J;US)
Gondhalekar, P.M., Extragalactic Infrared Astronomy, 11:30790 (R;GB)

Infrared observations of blue compact galaxies, 11:30796 (RA;GB)
Gonzales, A., Target hardness comparison to IAEA unyielding target, 11:30349 (R;US)
See Allen, G.C., 11:30348
Gooch, J.P., *See* Dahlin, R.S., 11:29701
See Dismukes, E.B., 11:29703
Goodfellow, H., *See* Kashdan, E.R., 11:29728
Goodman, C.D., *See* Taddeucci, T.N., 11:30487
Goodman, D.W., *See* Peden, C.H.F., 11:30201
Goodman, M.M., Design, synthesis and evaluation of 2-deoxy-2-iodovinyl-branched carbohydrates as potential brain imaging agents, 11:30652 (R;US)
Synthesis and biological evaluation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid, a new dimethyl-branched long-chain fatty acid to evaluate regional myocardial fatty acid uptake, 11:30661 (R;US)
Goradia, C., Possible radiation-resistant solar cell geometry using superlattices, 11:29527 (RA;US)
See Weinberg, I., 11:29532
Gordon, J.D., *See* Meier, W.R., 11:31210
Gordon, L.B., Stripline insulation design analysis by partial discharge measurements, 11:29564 (R;US)
Gorham-Bergeron, E., Evaluation of blast designs for in situ oil shale retorting, 11:29262 (BA;US)
Rock motion modeling of oil shale cratering experiments, 11:29264 (BA;US)
Gorker, G.E., Tandem Mirror Reactor power balance studies, 11:31115 (J;US)
See Murray, J.G., 11:31005
Gorrell, R.L., *See* Maxwell, B.P., 11:29215
Goswitz, A.M., *See* Whealton, J.H., 11:31199
Goudonnet, J.P., *See* Bloemer, M.J., 11:30393
Gould, R.W., *See* Greene, G.J., 11:31023
Goulding, F.S., *See* Landis, D.A., 11:30429
See Loo, B.W., 11:30665
Graham, E.R., Uptake of waste Sr 90 and Cs 137 by soil and vegetation, 11:30589 (J;US)
Grambow, B., Leach testing of waste glasses under near-saturation conditions, 11:29429 (J;US)
Granatstein, V.L., *See* Fliflet, A.W., 11:31270
See Park, S.Y., 11:31269
Grangeat, P., 3D reconstruction for diverging X-ray beams, 11:30660 (R;FR)
Granzell, H., *See* Oestergren, A., 11:29877
Grant, M.W., *See* Sutherland, A.A., 11:29444
Grant, N.J., *See* Megusar, J., 11:31064
Grant, P.J., *See* Reilly, J.K., 11:29831
Grant, T.J., *See* Ostrow, S.L., 11:29747
Grantham, L.F., *See* Gay, R.L., 11:30189
Grasz, E.L., *See* Gordon, L.B., 11:29564
Gratzfeld, P., *See* Skudelny, H.C., 11:30062
Graves, E., Forecasting future industrial SO_2 and NO/sub x/ emissions, 11:30551 (J;US)
Gray, E.W., Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
Gray, H.B., *See* Brunschwig, B.S., 11:30292
Gray, J.W., *See* van den Engh, G.J., 11:30647
Gray, L.J., *See* Giles, G.E., 11:30328
Gray, R.W., *See* Altman, R.F., 11:29717
Graziano, V., *See* Triolo, R., 11:30263
Green, C., *See* Blackburn, D., 11:29838
Greenbaum, E., Photosynthetic water splitting. Annual report, March 1, 1985-February 28, 1986, 11:29546 (R;US)
See Reeves, M., 11:29457
Greenberg, J., Initial test results and test plan for differential temperature controllers used in solar energy systems, 11:29600 (R;US)
Greene, G.A., Independent analysis of selected core-concrete interaction and fission product release experiments with CORCON-MOD2 and VANESA, 11:29829 (R;US)
Greene, G.J., Electric and magnetic excitation of ICRF waves: eigenmodes and wave packets, 11:31023 (BA;US)
Greer, C.W., Vitrokele compositions: novel, high affinity, metal selective and regenerable media for the removal of radioactive metals from aqueous nuclear waste streams, 11:29357 (RA;US)
Gregory, R.W., *See* Takayasu, M., 11:29219
Grenquist, S., *See* Ruchti, R., 11:30474
Gress, J., *See* Mann, W.A., 11:30824
Grewe, K., *See* Baudisch, H., 11:29382
Griest, W.H., Influence of carbonaceous particles on the interaction of coal combustion stack ash with organic matter, 11:29185 (J;US)
Griffin, C.W., *See* Marchant, D.D., 11:29983
Griffin, G.W., *See* Reichel, L.W., 11:30298
Griffin, H., *See* Sunderman, F.W. Jr., 11:30729
Griffith, M.G., Controlling compatibility of residual fuel oils, 11:29239 (RA;US)
Griffith, N.A., *See* Nelson, D.J., 11:30607
Griffith, R.V., Tissue-equivalent torso phantom for calibration of transuranic-nuclide counting facilities, 11:30951 (R;US)
Grigg, A., *See* Blackburn, D., 11:29838
Grigg, P.F., Assessment of the cost-effectiveness and potential of heat pumps for domestic hot water heating, 11:29993 (R;GB)
Grill, A., *See* Manory, R.R., 11:30123
Grimes, P., Circulating electrolyte zinc/bromine battery test program and procedures, 11:29888 (RA;US)
Grimes, W.R., *See* Moir, R.W., 11:31143
Grinden, B., Energy use in the commercial sector: the Norwegian energy consumption system and physical/technical energy models, 11:29968 (RA;US)
Grindstaff, Q. G., *See* Pavelka, E. A., 11:30110
Gris, Y., *See* Leray, J.L., 11:30150
Grisham, L.R., *See* Williams, M.D., 11:31198
Grivet, C., *See* Zeiger, E., 11:30680
Groebner, R.J., Comparison of experimentally-inferred ion thermal diffusivities with neoclassical theory for neutral beam-heated discharges in the Doublet III tokamak, 11:30969 (R;US)
Grom, R., Durasil ion exchangers: experience at Arkansas Nuclear One, 11:29351 (RA;US)
Grootes, P.M., *See* Hedges, J.I., 11:30605
Grossbeck, M.L., Tensile properties of helium-injected V-15Cr-5Ti after irradiation in EBR-II, 11:31059 (RA;US)
See Rowcliffe, A.F., 11:31050
Grosser, E.D., *See* Nieuwland, H.C.D., 11:30094
Grouiord, J.Y., *See* Bachelier, D., 11:30905
Grossman, R. J., High resolution in situ ultrasonic corrosion monitor, 11:29807 (P;US)
Groth, J.T., *See* Schiffhauer, M.A., 11:29397
Grover, J. M., Mechanically attached load pad for liquid metal nuclear reactor fuel assemblies, 11:29782 (P;US)
Grover, J.M., *See* Straalsund, J.L., 11:31246
Grubb, D.P., Determining plasma-fueling sources with an end-loss ion spectrometer. Revision 1, 11:31082 (R;US)
Gruber, E.E., Gas-bubble growth mechanisms in the analysis of metal fuel swelling, 11:30082 (R;US)
Gruen, D.M., *See* Brooks, J.N., 11:31163
See Krauss, A.R., 11:31236
Guber, W., Industrial demonstration plant for granulation of simulated radioactive and toxic wastes, 11:29356 (RA;US)
Guentner, R.J., *See* McKinnon, M.A., 11:29303
Guichard, A., *See* Bachelier, D., 11:30905
Guillet, H., Cadarache - 20 years of plutonium fuels, 11:29805 (R;FR;In French)
Gundel, L.A., *See* Dod, R.L., 11:30537
Gunderson, G.R., *See* Turner, L.R., 11:31164
Gung, C., *See* Youssef, M., 11:31033
Gung, C.Y., *See* Abdou, M.A., 11:31086
Gupta, R.K., Alpha-clustering in 75 MeV $^{16}O + ^{40}Ca$ as a collective mass fragmentation process, 11:30908 (R;XA)
Gurlusky, P.J., *See* Mrotek, E.N., 11:30066
Gussone, H.A., Forest damage in Lower Saxony, 11:30710 (RA;DE;In German)
Gustke, J.M., *See* Skinner, M.F., 11:29730
Guthrie, G.L., Light Water Reactor Pressure Vessel Surveillance Dosimetry Improvement Program. PSF Blind Test workshop minutes. Summary, 11:29750 (R;US)
Gutschick, V.P., Portable monitor for solar radiation that accumulates irradiance histograms for 32 leaf-mounted sensors, 11:30505 (J;NL)
Guymon, R.H., Safety implications associated with in-plant preasurized gas storage and distribution systems, 11:29872 (J;US)
Gyapong, G.J., *See* Fewell, M.P., 11:30919

H

Haas, K.A., *See* Teuchert, E., 11:29775
Haas, P.A., *See* Osborne, M.F., 11:29855
Haase, C.S., Geology of the host formation for the new hydraulic fracturing facility at Oak Ridge National Laboratory, 11:29375 (RA;US)
See Stow, S.H., 11:29376
Haberichter, W., *See* Dawson, J., 11:30448
Hacker, C.S., Use of time series methods for estimating hazard, 11:30599 (RA;US)
Hackett, E.M., *See* Joyce, J.A., 11:30104
Hackman, R.J., *See* Williams, P.E., 11:29288
Haddad, M., Post-neutron mass distribution for ^{233}U(nsub(th),f), 11:30925 (R;FR)
Haenssgerli, F., *See* Schmid-Haas, P., 11:30714
Hagen, W. F., *See* Summers, M. A., 11:30366
Hagenson, R.L., Steady-state spheromak reactor studies, 11:31179 (J;US)
See Krakowski, R.A., 11:31074
Haggin, G., *See* Boercker, D.B., 11:30983
Hagood, M.C., Structure and evolution of the Horse Heaven Hills in South-Central Washington, 11:29414 (R;US)
Hahn, F.F., *See* Scott, B.R., 11:29447
Hahn, S.R., *See* Drake, G., 11:30468
Haight, R.C., *See* Wong, C., 11:31154
Haines, J.E., ERS-1 power system, 11:29510 (RA;FR)
Haines, J.R., Impurity control and vacuum pumping system design and analysis for next-generation tokamaks, 11:31153 (J;US)
Haire, R.G., *See* Nave, S.E., 11:30190
See Young, J.P., 11:29426
Haissinski, J., New particle searches at e^+e machines, 11:30838 (R;FR)
Hajduk, J.C., *See* Ahluwalia, R.K., 11:29669
Hakonson, T., *See* Nyhan, J.W., 11:29404
Hakulin, L., National energy information system for Finland, 11:29917 (R;FI;In Finnish)
Halbach, K., Permanent magnet multipole with adjustable strength, 11:30357 (P;US)
Halbleib, J.A., *See* Sweeney, M.A., 11:31080
Haldeman, M., FASTBUS cooling, 11:30466 (J;US)
FASTBUS rack alarms and limits, 11:30465 (J;US)
Hale, A., *See* Jensen, J.R., 11:30620
Hall, F.D., *See* Szabo, M.F., 11:29736
Hall, G., A scintillator-photodiode position detector, 11:30460 (J;US)
Haller, G.M., Performance report for Stanford/SLAC Multi-Channel Sample-and-Hold Device, 11:30457 (J;US)
See Freytag, D.R., 11:30444
Halleux, J.P., *See* Casadei, F., 11:31279
Hallewell, G., *See* Ashford, V., 11:30449
Hallewell, G.D., *See* Apsimon, R.J., 11:30450
Haltiwanger, R.C., *See* Rajan, O.A., 11:30280
Halverson, D.C., Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
Hamad, M.A., *See* El Halwagi, M.M., 11:29470
Hamadani, S.M., Resonantly enhanced third-harmonic generation and multiphoton ionization in cesium vapor, 11:30811 (R;US)
Hamagaki, H., *See* Tanihata, I., 11:30895
Hamaker, H.C., *See* Werthen, J.G., 11:29521
Hamelin, C., *See* Haddad, M., 11:30925
Hameroff, S.R., *See* Smith, S.A., 11:30639
Hamilton, G.W., Magnetic ripple correction in tandem mirrors by ferromagnetic inserts, 11:31182 (J;US)
Hamilton, M.L., *See* Gelles, D.S., 11:31062
Hamilton, W.R., Computerized cost estimation spreadsheet and cost data base for fusion devices, 11:31116 (J;US)
Hammer, D.A., *See* Maron, Y., 11:31019
Hammer, J.M., *See* Meeker, D.J., 11:31225
Hammond, R.B., *See* Wagner, R.S., 11:30427
Hamza, A.V., Dynamics of dissociative adsorption of hydrogen on Ni(100), 11:30216 (J;US)
Handa, A.K., *See* LaRosa, P.C., 11:30645
See Singh, N.K., 11:30644
Hane, G.J., *See* Hutchinson, R.A., 11:29919
Haney, S.W., Modeling and optimization of operating parameters for a test-cell option of the Fusion Power Demonstration-II tandem mirror design, 11:31130 (J;US)
Hannegan, M.W., *See* Zeiger, E., 11:30680
Hannifan, M., Evaluation of SOLERAS solar cooling applications: a building case study and findings, 11:29593 (RA;US)
Hanold, R.J., *See* Whetten, J.T., 11:29981
Hansen, R.C., *See* Wong, C., 11:31154
Hansl-Kozanecka, T., *See* Hodges, C., 11:30452
See Young, C.C., 11:30476
Hanson, G.N., Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985, 11:30758 (R;US)
Hanson, J.D., *See* Swanson, D.G., 11:30965
Hara, F., *See* Lautenaleger, A., 11:30506
Harast, D.G., Brazing technique, 11:30108 (P;US)
Harben, P.E., Evaluation and design of a large spacing loop-loop electromagnetic tool, 11:30354 (R;US)
Hardee, H. C., *See* Dunn, J. C., 11:29624
Hardin, J.E., Rationale and methodology for group testing of electric vehicle batteries, 11:30051 (RA;US)
Hardin, J.N., *See* Rabideau, P.W., 11:30261
Harding, L.B., *See* Dunning, T.H. Jr., 11:30206
Hardt, T.L., *See* Rykken, L.E., 11:29396
Hardy, D.G., Transition from storage to permanent disposal of low- and intermediate-level wastes at the Chalk River Nuclear Laboratories, 11:29324 (RA;US)
Hardy, J.C., *See* Waters, J.W., 11:30181
Hardy, M.P., *See* Kim, K., 11:29415
See Perry, H.A., 11:29257
Harkins, R., *See* Soto, R., 11:29349
Harling, O.K., *See* Megusar, J., 11:31064
Harmon, A.C., Enzymatic assay for calmodulins based on plant NAD kinase activity, 11:30640 (J;US)
Harmon, D.L., *See* Duncan, M.W., 11:30529
See Kashdan, E.R., 11:29728
Haroutunian, R., *See* Bachelier, D., 11:30905
Harper, C.A., Salton Sea scientific drilling program: drilling program status, 11:29618 (RA;US)
Harper, F.T., *See* Benjamin, A.S., 11:29862
Harper, W.V., Geostatistical analysis of potentiometric data in Wolfcamp aquifer of the Palo Duro Basin, Texas, 11:30739 (R;US)
Harrell, J., *See* Rengan, K., 11:29804
Harries, J.E., *See* Carli, B., 11:30539
Harris, C.J., *See* Taylor, R.W., 11:29282
Harris, D.B., Design optimization of single-main-amplifier KrF laser-fusion systems, 11:31230 (J;US)
KrF laser cost/performance model for ICF commercial applications, 11:31227 (J;US)
Megajoule-class single-pulse KrF laser test facility as a logical step toward inertial fusion commercialization, 11:31229 (J;US)
See Welch, D.R., 11:31256
Harris, M., *See* Batley, R., 11:30485
Harrison, F.B., *See* Godwin, R., 11:30160
Harrison, R.A., X-ray signature of solar coronal mass ejections, 11:30789 (R;GB)
Hart, E.J., *See* Sauer, M.C. Jr., 11:30299
Hart, R.E. Jr., Demonstrated results of welded and soldered interconnections, 11:29541 (RA;US)
Hart, V.E., *See* Bolton, R.D., 11:30491
Hartley, C.S., *See* Badalamente, R.V., 11:29852
Hartley, J.N., *See* Elmore, M.R., 11:30557
Hartman, C.W., *See* Meeker, D.J., 11:31225
Hartman, F.C., *See* Herndon, C.S., 11:30638
Hartmann, B., Memorandum - optical radiation danger when using RSV, 11:30730 (TG;US)
Hartmann, J., *See* Arasteh, D., 11:30003
Hartung, R., Overview of risk assessment in aquatic ecology, 11:30596 (RA;US)
Harty, R., *See* Swartzman, G.L., 11:30614
Harvey, P.M., *See* Lester, D.F., 11:30784
Harvey, R.W., ICRF fusion reactivity enhancement in tokamaks, 11:30994 (J;AT)
Harvey, T.F., *See* Shapiro, C.S., 11:30697
Hasanein, A.M., Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
Hasegawa, P.M., *See* LaRosa, P.C., 11:30645
See Singh, N.K., 11:30644
Hashimoto, O., *See* Tanihata, I., 11:30895
Hassan, A.M., *See* Hussein, A.Z., 11:30507
Hassanein, A.M., *See* Cha, Y.S., 11:31105
See Ehst, D.A., 11:31197
See Sze, D.K., 11:31096
Hassenzahl, W.V., *See* Dietderich, D.R., 11:30342
Hassig, J., *See* Biary, F., 11:29771
Hassler, L.A., *See* Pettus, W.G., 11:29760

Hasuyama, Hiroki, Application of polarized ions to fusion reactors, 11:30974 (RA;JP)
Hata, W.Y., *See* Shiao, S.Y., 11:30174
Hatch, F.T., Identification of mutagens from the cooking of food, 11:30726 (BA;US)
Hatch, H., *See* Wada, M., 11:29899
Hau, E., *See* Pernpeintner, R., 11:29659
Haubenreich, P.N., *See* Fietz, W.A., 11:31170
Hauf, M.J., *See* Cline, J.E., 11:30177
Hauptmanns, U., Evaluation of criteria for the application of systems-analytical methods for safety analyses of chemical plants, 11:30390 (R;DE;In German)
Haussmann, G., Effect of energy feedback mechanisms on the oxidation rate of pulverized coal. Quarterly report, December 1, 1985-February 28, 1986, 11:29217 (R;US)
Hawarden, T.G., Starbursts in non-interacting galaxies, 11:30792 (RA;GB)
Hawighorst, A., Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Hawks, R.D., *See* Szabo, M.F., 11:29736
Hawley, E.H., *See* Ardron, K.H., 11:29776
Hawley, K.A., Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual, 11:29450 (R;US)
Hawrylak, R.J., *See* Efthimion, P., 11:31004
Hawthorne, J.R., Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Hawthorne, S.B., Identifying alkylbenzene isomers with chemical ionization-proton exchange mass spectrometry, 11:30268 (J;US)
Hay, H.J., *See* Dincklage, R.D. von, 11:30915
Hay, J.C., *See* Shaughnessy, E.J., 11:29727
Hay, P.J., Synthesis and X-ray structure of $(C_5Me_5)_2Th(\mu\text{-}PPh_2)_2Pt(PMe_3)$: a complex with a thorium-platinum bond, 11:30316 (J;US)
Hayden, M., *See* Wait, G.D., 11:30417
Hayenson, R.L., *See* Copenhaver, C., 11:31175
Hayes, J.V., *See* Raynor, G.S., 11:30521
Hayssen, J., *See* Sornjitti, P., 11:29476
Hayward, P.J., *See* Speranzini, R.A., 11:29427
Hazlett, R.N., *See* Mushrush, G.W., 11:29274
Healey, D.C., *See* Wait, G.D., 11:30417
Healey, J.H., *See* Ostrow, S.L., 11:29747
Heath, J.R., *See* Zhang, Q.L., 11:30248
Heath, R.L., *See* Caffrey, A.J., 11:30472
Heatherly, L., *See* Packan, N.H., 11:30088
Hedberg, H.O., *See* Aronsson, R., 11:29991
Hedges, J.I., Organic carbon-14 in the Amazon River system, 11:30605 (J;US)
Heifetz, D., *See* Galambos, J.D., 11:31235
Heimann, R.B., Hydrothermal flow-through apparatus to simulate leaching of nuclear waste forms under quasi-dynamic conditions, 11:29431 (R;CA)
Heineman, J.B., *See* Mueller, C.J., 11:29860
Heinisch, H.L., *See* Brager, H.R., 11:31036
Heistand, R.N., Estimating solid wastes from oil shale facilities, 11:29283 (BA;US)
Heller, E.J., *See* Reimers, J.R., 11:30816, 11:30817
Heller, J.P., Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Hemeid, A.A., Desirable orientation and proportion of courtyards for Riyadh region, 11:29580 (RA;US)
Hemet, P., *See* Dion, L., 11:30073
Henderson, J.D., Operating experience with a dry active waste shredder/compactor at a nuclear power plant, 11:29384 (RA;US)
Hendrey, G.R., Cross-sectional analysis of sulfate concentrations in the surface waters of New York and New England, 11:30608 (R;US)
Henning, C.D., A tokamak ignition/burn experimental research device, 11:31123 (J;US)
Hennino, T., *See* Bachelier, D., 11:30905
Henriks, L., *See* Siitonen, H., 11:30027
Henry, J.L., *See* White, J.C., 11:29277
Hensiee, S.P., Elemental volatility of HT-9 fusion reactor alloy, 11:31240 (J;US)
Heppelman, S., *See* Dawson, J., 11:30448
Hermann, O.W., *See* Alsmiller, R.G. Jr., 11:30946
Hernandez, E., Passive cooling in Mexico, Mexico City, 11:29596 (RA;US)
Herndon, C.S., 2-(4-bromoacetamido)anilino-2-deoxypentitol 1,5-bisphosphate, a new affinity label for ribulose bisphosphate carboxylase/oxygenase from Rhodospirillum rubrum: determination of reaction parameters and characterization of an active site peptide, 11:30638 (J;US)
Herrera, W.J., *See* Nyhan, J.W., 11:30618
Herrmann, W., Research directions in solid dynamics, 11:30387 (R;US)
Hershkowitz, N., *See* Brooks, J.N., 11:31161
Hertel, N.E., *See* Poor, N.D., 11:29335
Hertel N.E., Transmission of fast neutrons through an iron sphere, 11:31091 (J;US)
Hertzberg, V., *See* Maxon, H., 11:30695
Herwing, L.O., *See* Prince, M.B., 11:29563
Hessing, T., *See* Atac, M., 11:30454
Heusch, C.A., Gluonium candidates from hadronic and e^+e^- interactions, 11:30845 (R;US)
Heustess, J.E., *See* Snell, M.K., 11:29454
Heuze, F.E., *See* Lin, W., 11:29250
See Shaffer, R.J., 11:29252
Hewitt, T.R., Evaluation of street sweeping as a means of controlling urban particulate, 11:30534 (RA;US)
Hickey, E.E., *See* Martin, G.F., 11:29851
Hickle, G.L., Waste Systems progress report, March 1984-February 1985, 11:29413 (R;US)
Higbie, P.R., *See* Baker, D.N., 11:30809
Higgins, J.C., Review of issues related to improving nuclear power plant diesel generator reliability, 11:29803 (R;US)
Highley, J., Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
Higuchi, S., *See* Nakamura, O., 11:29673
Hildebrand, C.E., *See* Stallings, R.L., 11:30724
Hill, K.W., *See* Liew, S.L., 11:31001
Hill, R.W., *See* Stephens, D.R., 11:29172
Hinde, D.J., *See* Leigh, J.R., 11:30914
Hinze, W.J., Exploration for Hot Dry Rock geothermal resources in the Midcontinent USA. Volume 1. Introduction, geologic overview, and data acquisition and evaluation, 11:29622 (R;US)
Hioki, Zenro, Proton decay in grand unified theories, 11:30868 (RA;JP)
Hirabayashi, H., Proceedings of the first TRISTAN phase II workshop, 11:30831 (R;JP)
Hiramatsu, T., *See* Takahashi, S., 11:29883
Hiromoto, R.E., *See* Wienke, B.R., 11:30950
Hironaga, K., *See* Masuda, S., 11:29721
Hirose, K., *See* Kawasaki, S., 11:31070
Hirst, E., *See* Goeltz, R., 11:30015
Hitachi, A., *See* Fessenden, R.W., 11:30274
Hitlin, D., *See* Dubois, R., 11:30455
Hitoshi Nishino, *See* Huebsch, T., 11:30861
Hitz, C.G., *See* Katonak, L.E., 11:29764
See Negin, C.A., 11:29395
Hjalmarson, H.P., *See* Drummond, T.J., 11:30166
Hlava, P.F., *See* Westrich, H.R., 11:29639
Ho, P., *See* Yeh, Y.C.M., 11:29528
Ho, P.C., Photooxidation of 2,4-dinitrotoluene in aqueous solution in the presence of hydrogen peroxide, 11:30612 (J;US)
Hoard, R.W., *See* Henning, C.D., 11:31123
Hobbs, R., *See* Place, B.G., 11:29281
Hodge, D.S., Heat flow and subsurface temperature distributions in central and western New York. Final report, 11:29617 (R;US)
Hodges, C., Analysis of digitized waveforms in a prototype of the SLD central drift chamber, 11:30452 (J;US)
Hodges, C.L., *See* Young, C.C., 11:30476
Hodges, T., *See* Dubois, R., 11:30455
Hodgson, M.E., *See* Jensen, J.R., 11:30595
Hodgson, R., Battery data for use in expert systems, 11:29892 (RA;US)
Hoemke, P., *See* Hauptmanns, U., 11:30390
Hoffman, A.L., *See* Crawford, E.A., 11:30371
Hoffman, D.J., Experimental measurements of the ion cyclotron antennas' coupling and RF characteristics, 11:31193 (J;US)
ICRH coupling in DIII-D, 11:31028 (R;US)
Material and electromagnetic properties of Faraday shields for ion cyclotron heating antennas, 11:31191 (J;US)
See Baity, F.W., 11:31026
See Owens, T.L., 11:31192
See Schechter, D.E., 11:31233
See Whealton, J.H., 11:31199
Hoffman, E.J., Examination of the role of detection systems in quantitation and image quality in PET, 11:30439 (J;US)
Hoffman, N.J., Polonium aspects associated with the use of lead-lithium

blankets in fusion applications, 11:31221 (J;US)
See Murray, K.A., 11:31222
Hoffmann, A., Global methods for reinforced concrete slabs, 11:30151 (R;FR)
Hofmann, M., Development potential and policies in the South Arabian countries Yemen Arab Republic, People's Democratic Republic of Yemen, Sultanate of Oman, 11:29938 (R;DE)
Hofmann, P.J., *See* Wieling, N., 11:30093
Hogan, W.J., *See* Blink, J.A., 11:31223
See Meier, W.R., 11:31231
Hohlfeld, J., *See* Zimmermann, C., 11:29478
Hojsak, W., *See* Efthimion, P., 11:31004
Holbein, B.E., *See* Greer, C.W., 11:29357
Holbrook, G.P., Reduced apparent photorespiration by the C_3-C_4 intermediate species, Moricandia arvensis and Panicum milioides, 11:30633 (J;US)
Holcombe, C. E., Electrically conductive containment vessel for molten aluminum, 11:30112 (P;US)
Holdren, J.P., How safe is safe enough? The relation of environmental characteristics and economic competitiveness in fusion-reactor design, 11:31213 (J;US)
Holladay, G., *See* Harben, P.E., 11:30354
Holland, D.F., *See* Reilly, H.J., 11:31214
Holland, G.E., *See* Crawley, H.B., 11:30467
Holland, W.D., *See* Morgan, J.G., 11:29295
Hollebeek, R., ASP: a search for single photon events at PEP, 11:30846 (R;US)
Hollenberg, G., *See* Tilack, M., 11:31245
Hollenberg, G.W., *See* Liu, Y.Y., 11:31097
Hollenburg, G.W., *See* Straalsund, J.L., 11:31246
Holloway, R.M., *See* Watson, N.D., 11:30426
Holm, S., *See* Haldeman, M., 11:30466
Holman, B.L., *See* Lanza, R.C., 11:30666
Holman, P.L., *See* Pettus, W.G., 11:29760
Holman, R., *See* Accetta, F.S., 11:30880
Holmes, H.C., Training and development and education at Lawrence Livermore National Laboratory, 11:31273 (R;US)
Holmes, J.T., Screening ceramic materials for intense radiant heat applications, 11:30134 (BA;US)
Holst, L., Laboratory studies of the kinetics at high temperature pyrolysis of shale. Final report, 11:29275 (R;SE;In Swedish)
Holt, N., *See* Alpert, S.B., 11:29680
Holten, T. van, Analytical theory for rotor-tipvane performance and comparison with experimental results, 11:29656 (RA;DE)
Holtkamp, D.B., *See* Seestrom-Morris, S.J., 11:30939
Holzhausen, G.R., *See* Stow, S.H., 11:29376
Hom, K., *See* Parker, T.E., 11:30033
Homer, J.F. Jr., *See* Crawley, H.B., 11:30467
Honea, F.I., Great Plains Gasification Project process stream design data, 11:29157 (R;US)
See Miller, W.R., 11:29154
Hong, F., Crystallite size effect in the selective oxidation of butene to butadiene on iron oxide. 1. Moessbauer, X-ray, and magnetization characterization of the catalysts, 11:30229 (J;US)
Hong, R., Modified 180° separation magnet for DIII-Big Dee neutral beam injectors, 11:31207 (J;US)
Honig, E.M., Counterpulse railgun energy recovery circuit, 11:30400 (P;US)
Honkanen, J., *See* Cable, M.D., 11:30907
Hooper, E.B., *See* Turner, W.C., 11:31259
Hoover, W.C., *See* Blink, J.A., 11:31189
Hopkins, G.R., Low activation diagnostic equipment design studies, 11:31002 (J;US)
See Cheng, E.T., 11:31241
Hopper, C.M., US DOT Specification 6M radioactive fissile material package nuclear criticality safety re-evaluation, 11:30334 (R;US)
Horak, J.A., *See* Grossbeck, M.L., 11:31059
Horazak, D.A., *See* Maxwell, B.P., 11:29216
Horen, D.J., *See* Taddeucci, T.N., 11:30487
Horn, F.L., Particle bed reactor propulsion vehicle performance and characteristics as an orbital transfer rocket, 11:29824 (R;US)
See Powell, J.R., 11:29783, 11:29784
Horne, W.E., Space Environment Workshop, 11:29544 (RA;US)
See Day, A.C., 11:29529
Horney, F.A., *See* Belba, V., 11:29689
See Belba, V.H., 11:29734
Horning, T.L., ESR and ENDOR of bacteriopheophytin a radicals. Implications for bacteriochlorophylls in vivo, 11:30625 (J;US)
Hornstra, F., Autonormalization of battery test data to significantly reduce impact of battery aging on test results, 11:29886 (RA;US)
Simple methodology for obtaining battery discharge times (and vehicle ranges) for arbitrarily structured load profiles, 11:30061 (RA;US)
Test programs at the National Battery Test Laboratory, 11:29885 (RA;US)
Hoshino, K., Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
Hosokawa, S., *See* Masuda, S., 11:29705, 11:29713
Hospodarec, R.W., *See* Miller, W.R., 11:29154
Hostick, C.J., Hanford regulated laundry: inventory control and production improvement study, 11:30344 (R;US)
See Triplett, M.B., 11:29423
Hourani, E., *See* Azaiez, F., 11:30911
Hovestadt, D., *See* Mason, G.M., 11:30786
Hovingh, J., Comparison of the design and costs of induction linac drivers for inertial fusion using ions of differing mass, 11:30409 (R;US)
Howerton, R.J., *See* Wong, C., 11:31154
Hoyt, H.C., Simple ballistic-missile-defense model to help decision makers, 11:30517 (J;US)
Hsu, G., Electricity use in Taiwan's service sector, 11:29957 (RA;US)
Hsu, I.C., Environmental carcinogens in human target tissues in culture. Progress report, 11:30715 (R;US)
Hsu, L.S., Reduction of substrate interference in Raman spectroscopy of submicron titania coatings, 11:30136 (J;US)
Hu, W.L., Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22}n/cm^2, 11:31060 (RA;US)
Huang, F.H., Effects of irradiation on the fracture toughness of HT-9, 11:31066 (RA;US)
Huang Zhijie, Multiple utilization of the biomass, 11:29466 (RA;DE)
Hubbard, J.L., *See* Lichtenberger, D.L., 11:30266
Hubel, H., *See* Byrne, A.P., 11:30922
Huber, J., *See* Hauptmanns, U., 11:30390
Huber, S.C., *See* Caspar, T., 11:30627
Huebsch, T., Do superstrings lead to quarks or to preons, 11:30861 (R;XA)
Huffman, J.C., *See* Chisholm, M.H., 11:30210
Hughes, E.B., *See* Walton, J.T., 11:30430
Hughes, J.M., Power plant plume opacity control, 11:29704 (RA;US)
Huh, K.Y., *See* Sviatoslavsky, I.N., 11:31151
Huie, R.E., Kinetics of one-electron transfer reactions involving ClO_3 and NO_2, 11:30204 (J;US)
Huizenga, C.A., *See* Wilcox, B.A., 11:29568
Hull, L.C., *See* Stiger, S.G., 11:29911
Hum, G., *See* Ross, D.S., 11:29163
Humphreys, P.C., *See* Rosa, E.A., 11:29853
Hunkele, W., Liquid radwaste processing, operational experience utilizing Duratek Mobile Process System (MPS), 11:29391 (RA;US)
Hunt, A.L., *See* Turner, W.C., 11:31259
Hunt, G.L., *See* Hardin, J.E., 11:30051
Hunt, J., Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)
Hunter, A.M., Scaling of KrF lasers for inertial confinement fusion, 11:31092 (J;US)
Hunter, J.C., Manganese, technetium, and rhenium, 11:30221 (BA;US)
Hunter, R.O., *See* Hunter, A.M., 11:31092
Huray, P.G., *See* Nave, S.E., 11:30190
Hurst, F.J., Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid, 11:29424 (J;NL)
Hurst, J., *See* MacKenzie, I.K., 11:30483
Hurtubise, R.J., Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Husmann, K., *See* Chrysochoides, N.G., 11:29820
Huss, G., *See* Pernpeintner, R., 11:29659
Hussein, A.Z., Simulated borehole for ore depth evaluation by neutron capture gamma-ray technique using Pu/Be neutron source, 11:30507 (R;EG)
Huszagh, D. W., Machine for applying a two component resin to a roadway surface, 11:30022 (P;US)
Hutchby, J., Cell research and technology workshop, 11:29543 (RA;US)
Hutchinson, R.A., Information flow from Japan to US researchers in applied

and basic energy research fields, 11:29919 (J;US)
Huth, J., Feasibility tests of a high resolution sampling radial drift chamber, 11:30488 (J;NL)
Hyman, E.A., *See* Pivec, A., 11:29671

I

Iacovangelo, C. D., Coated powder for electrolyte matrix for carbonate fuel cell, 11:29986 (P;US)
Electrolyte reservoir for carbonate fuel cells, 11:29985 (P;US)
Iji, Teruo, Advanced cement solidification process, 11:29352 (RA;US)
Ikeuchi, S., Galaxy formation theory and large scale structure in the universe, 11:30775 (RA;JP)
Iles, P.A., *See* Yeh, Y.C.M., 11:29528
Im, K.H., *See* Ahluwalia, R.K., 11:29669
Imhoff, C.H., *See* Hostick, C.J., 11:30344
See Triplett, M.B., 11:29423
Inaba, S., *See* Drake, G., 11:30468
Inatani, Junji, Recent observations of the galactic center, 11:30772 (RA;JP)
Inculet, I.I., *See* Castle, G.S.P., 11:29694
Innes, W., Rotor electrometer for fractional charge searches, 11:30499 (R;US)
Inouye, M., Development of computational fluid dynamics at NASA Ames Research Center, 11:30381 (RA;JP)
Ioki, Kimihoro, *See* Shibata, Keiichi, 11:30900
Ismail, S., *See* Browell, E.V., 11:30538
Isnard, P., *See* Clerc, M., 11:29290
Itagaki, T., *See* Masuda, S., 11:29721
Itoh, R., Performance of the field-shaping strips in the TOPAZ-TPC sector, 11:30453 (J;US)
Ivanov, M.A., *See* Dineykhan, M., 11:30857
Ivett, J.L., *See* Tice, R.R., 11:30649

J

Jackson, B.L., *See* Crosetti, M.R., 11:29559
Jackson, L.P., *See* Esmaili, E., 11:29286
Jackson, P.L., *See* Emge, T.J., 11:30245
Jackson, R., Model for the flow of particulate matter with application to chutes. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29205 (R;US)
Jacob, N.P., Radwaste ion-exchange optimization, 11:29392 (RA;US)
Jacobs, D.G., *See* McBrayer, J.F., 11:29329
Jacobs, H.R., Initial results of Green River Oil Shale Processing using the University of Utah's pilot scale bottom burning retort, 11:29269 (BA;US)
Jacobson, A., Invited paper: measurements and model of the coupled particle loss and fluid acceleration in the boundary layer of the zt-40m reversed-field pinch, 11:31262 (BA;US)
Jaeger, E.F., *See* Hoffman, D.J., 11:31028
James, D.R., *See* Bloemer, M.J., 11:30393
Jamieson, D.R., Polyimide scale-up in a new facility, 11:30332 (R;US)
Janoski, K., *See* Finkel, B., 11:31276
Janousek, B.K., Thermal stress cycling of GaAs solar cells, 11:29540 (RA;US)
Jansky, M.T., Slurry growth: the characterization of a unique phenomenon at the Hanford Site, 11:29394 (RA;US)
Jansson, S.A., *See* Almqvist, P., 11:29223
Jantzen, C.M., Scientific basis for Nuclear Waste Management VIII, 11:29428 (B;US)
Jaouen, C., *See* Iji, Teruo, 11:29352
Jaramillo, S.A., *See* Yates, G.J., 11:30494
Jardine, L.J., *See* Engelhard, M.P., 11:29393
Jarnot, R.F., *See* Waters, J.W., 11:30181
Jarrett, H.W., *See* Harmon, A.C., 11:30640
Jarvie, T.P., *See* Thayer, A.M., 11:30239
Jayakaran, P.N., *See* Purcupile, J.C., 11:29267
Jean Marie, B., DM2 results on J/psi decays, 11:30839 (R;FR)
Jeffries, J.B., Kinetics of the reaction OH + NH_3, 11:30208 (J;US)
Jensen, C.E., *See* Hunkele, W., 11:29391
Jensen, C.M., *See* Purcupile, J.C., 11:29267
Jensen, H.B., The Collider Detector at Fermilab (CDF), 11:30441 (J;US)
Jensen, J.R., Feasibility study of wood stork foraging habitat mapping using landsat multispectral data, 11:30595 (R;US)
Vegetational stress detection in a southeastern swamp floodplain using remote sensing and in-situ spectral measurements, 11:30620 (R;US)
Jensen, L.G., Effect of inflation on anisotropic cosmologies, 11:30765 (R;US)
Jensen, R.M., Comparison of dry injection systems at normal and high flue gas temperatures, 11:29195 (RA;US)
Jensen, T., *See* Batley, R., 11:30485
Jeppson, D.W., Safety considerations of lithium lead alloy as a fusion reactor breeding material, 11:31239 (J;US)
Jessop, D., *See* Sauer, R.E., 11:29385
Jezierski, H., Conceptual design for the injection of tritiated effluents into deep geological formations, 11:29361 (RA;US)
Jhingran, S.G., *See* Leblanc, A., 11:30310
Jin Yao, Primary approach to the engineering of centralized biogas supply system in Shanghai outskirts, 11:29467 (RA;DE)
Jitsukawa, S., *See* Rowcliffe, A.F., 11:31050
Jo, J.H., Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Joel, D.D., *See* LeFevre, M.E., 11:30684
Joensson, B., Mechanical dewatering of peat treated with chemicals. Final report, 11:29213 (R;SE;In Swedish)
Johansson, H., *See* Ganander, H., 11:29665
Johnson, R.C., Monitoring of downstream salmon and steelhead at federal hydroelectric facilities. Annual report 1985, 11:29493 (R;US)
Johnson, A.N., Volume reduction through dry active waste segregation, 11:29350 (RA;US)
Johnson, A.S., Performance of the SLD Warm Iron Calorimeter pre-prototype, 11:30477 (J;US)
Johnson, C.E., *See* Fischer, A.K., 11:31142
Johnson, D.B., *See* Fuller, R.K., 11:30621
Johnson, E. A., Method of saccharifying cellulose, 11:30267 (P;US)
Johnson, J.A., *See* Carlson, N.M., 11:30384
Johnson, J.N., *See* Tang, P.K., 11:30512
Johnson, J.S. Jr., *See* Shiao, S.Y., 11:30174
Johnson, K.A., *See* Staudhammer, K.P., 11:30098
Johnson, L.H., Fuel characterization research for the Canadian Nuclear Fuel Waste Management Program, 11:29315 (R;CA)
Johnson, P.E., *See* Joy, D.S., 11:29308
Johnson, R.H., *See* Hertel N.E., 11:31091
Johnson, R.R., Expert system to control a fusion energy experiment, 11:31084 (R;US)
Johnson, T.H., *See* Hunter, A.M., 11:31092
Johnson, T.L., Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)
Johnston, B.H., *See* Perkins, L.J., 11:31168
Johnston, B.M., *See* Henning, C.D., 11:31123
Johnston, R.M., Effect of pH on the stability of smectite, 11:30148 (R;CA)
Hydrothermal stability of bentonite-based buffer materials, 11:30149 (R;CA)
Jonah, C.D., *See* Trifunac, A.D., 11:30304
Jones, D.W., Land use model with a constant-utility spatially variant wage, 11:30592 (J;US)
Local taxation and the consequences of revenue distribution patterns, 11:30622 (J;NL)
Jones, E.R. Jr., Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Jones, G. II., Pyridinium quenchers of $Ru(bpy)_3^{2+}$ charge effects of the yield of electron transfer, 11:30291 (J;US)
Jones, H.M., *See* Pettus, W.G., 11:29760
Jones, K.B., Transport, installation, and testing of a transportable volume reduction and bitumen solidification system, 11:29388 (RA;US)
Jones, R.H., Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Jones, R.R.M., Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
Jones, R.W., Passive solar heating and analysis, 11:29582 (RA;US)
Jones, S.E., Engineering issues in muon-catalyzed fusion, 11:30998 (J;US)
Jones, W., *See* Alkezweeny, A.J., 11:30547
Jones, W.H., *See* Clark, L.M., 11:31293
Jordan, D.B., *See* Holbrook, G.P., 11:30633
Jordan, H.F., *See* Alaghband, G., 11:31280
Jorgensen, C.C., *See* Carter, R.J., 11:29791
Jorgensen, J.R., *See* Ma, M.S., 11:29323
Joseph, J., *See* Kispert, L.D., 11:30272

Joseph, R.D., *See* Chase, S.T., 11:30802
See Collins, C.A., 11:30801
See Hawarden, T.G., 11:30792
Jourdain, J.C., *See* Bachelier, D., 11:30905
Jowitt, D., *See* Cooper, C.A., 11:29839
Joy, D.S., U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Joyce, J.A., Application of the key curve and multi-specimen techniques to dynamic J-R Curve testing of alloy steel, 11:30104 (R;US)
Juhasz, A.J., Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Jung, J., A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts, 11:31095 (J;US)
An assessment of tritium breeding requirements based on the tritium fuel cycle, 11:31088 (J;US)
See Gohar, Y., 11:31135
See Moir, R.W., 11:31103
See Youssef, M., 11:31033
See Youssef, M.Z., 11:31032
Jungerstam, B., Vapour recompression evaporation of black liqour, 11:30026 (R;FI;In Finnish)
Junquera, T., *See* Bretonneau, P., 11:30408

K

Kabariti, M., *See* Taani, R., 11:29599
Kabir, P.K., Tests of T-invariance with slow neutrons, 11:30947 (R;US)
Kachare, R.H., *See* Mokashi, A.R., 11:29504
Kadel, R., *See* Yarema, R.J., 11:30471
Kafka, T., *See* Mann, W.A., 11:30824
Kahn, C., Divertor and edge plasma properties in Doublet III expanded boundary discharges, 11:30989 (J;AT)
Kaifer, R.C., A transuranic-aerosol-measurement system for the workplace or stack monitoring, 11:30432 (J;US)
Kaiser, N.E., Study of rewetting and quench phenomena by single pin out-of-pile experiments, with special emphasis on the effect of pin composition, 11:30379 (R;FR)
Kakuya, E., *See* Kinoshita, K., 11:29345
Kallio, G.A., Numerical computation of the electrical conditions in a wire-plate electrostatic precipitator using the finite element technique, 11:29700 (RA;US)
Kalne, E., *See* Rice, J.E., 11:31017
Kalne, J., *See* Rice, J.E., 11:31017
Kalsi, S.S., Octopole design concepts for the mirror end cell, 11:31184 (J;US)
TFCX current density and nuclear heating limitations for superconducting Tokamaks, 11:31166 (J;US)
Kaluzny, S., *See* Swartzman, G.L., 11:30614
Kalyanaraman, B., *See* Samskog, P.O., 11:30307
Kamada, K., *See* Kawasaki, S., 11:31070
Kamae, T., *See* Itoh, R., 11:30453
Kamat, P.V., Photoelectrochemistry in particulate systems. 3. Phototransformations in the colloidal TiO_2-thiocyanate system, 11:30173 (J;US)
Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue, 11:30284 (J;US)
Kamath, G.S., *See* Loo, R.Y., 11:29522
Kaminski, M.C., *See* Chan, D.W., 11:29364
Kammash, T., *See* Wojtowicz, D., 11:31167
Kamo, R., *See* Sekar, R.R., 11:30045
Kamperschroer, J.H., *See* Williams, M.D., 11:31198
Kane, S.R., *See* Laros, J.G., 11:30787
Kane, W.R., *See* McAuley, W.A., 11:29452
Kaneko, S., *See* Masuda, S., 11:29713
Kang, Z.H., *See* Bretonneau, P., 11:30408
Kangley, J.P., *See* Jacob, N.P., 11:29392
Kaplan, E., *See* Lipfert, F.W., 11:30553
Kaplan, S., *See* Simpson, D.B., 11:29867
Kaplan, S.N., Detection of charged particles in amorphous silicon layers, 11:30428 (J;US)
See Perez-Mendez, V., 11:30425
See Stearns, J.W., 11:31219
Kapustinsky, J.S., Fast timing light pulser for scintillation detectors, 11:30489 (J;NL)
See Sunier, J.W., 11:30490
Karaki, S., Performance and economic assessment of state-of-the-art solar cooling systems, 11:29573 (RA;US)
Karlsson, H.T., Experience from wet/dry desulfurization in Sweden, 11:29197 (R;SE)
Karoly, W.J., *See* Wiernicki, C., 11:30731
Karow, F., *See* Baudisch, H., 11:29382
Karpenko, V.N., The Mirror Fusion Test Facility (MFTF-B)--status, 11:31118 (J;US)
Karraker, D.G., *See* Jones, E.R. Jr., 11:30219
Karstroem, A., Vertical recirculation-type evaporators. An investigation of heat transfer and refrigerant circulation, 11:29989 (R;SE;In Swedish)
Karukstis, K.K., Potentiometric titration of Photosystem II fluorescence decay kinetics in spinach chloroplasts, 11:30642 (J;NL)
Kashdan, E.R., Technical manual on hood capture systems to control process fugitive particulate emissions, 11:29728 (RA;US)
Kashiwai, Toshihiko, *See* Nishihara, Yukoi, 11:29346
Kassner, T.F., *See* Park, J.Y., 11:29754
Kasten, D.G., 400 Hz welding transformer gun assembly evaluation. Final report, 11:30394 (R;US)
400 Hz welding transformer gun assembly evaluation. Final report, 11:30395 (R;US)
Kasyk, G., *See* Bradley, F.J., 11:29408
Katakura, Jun-ichi, Attempt for revision of JNDC FP Decay Data File, 11:30913 (R;JP)
Katonak, L.E., Three Mile Island Unit 2 dry-canal defueling water cleanup system: an update, 11:29764 (RA;US)
Katz, D., *See* Place, B.G., 11:29281
Katz, J.J., *See* Gevertz, D., 11:30699
Kauffman, E.G., *See* Alvarez, W., 11:30573
Kaun, T. D., Cell design for lithium alloy/metal sulfide battery, 11:29903 (P;US)
Kaushik, S.C., Advanced absorption solar air-conditioning systems: thermal modeling and design aspects, 11:29597 (RA;US)
See Gadhi, S.M.B., 11:29595
Kaushik, S.M., Gas evolution oscillators. 6. Quantitative characterization of an experimental system, 11:30262 (J;US)
Kawahara, W.A., SNLL materials testing compression facility, 11:30389 (R;US)
Kawamoto, H., *See* Wada, M., 11:29899
Kawamura, Fumio, *See* Uetake, Naohito, 11:30153
Kawasaki, S., Comparative study of free electron laser experiments in longitudinal and transverse wiggler geometries, 11:31070 (RA;JP)
Kawata, Shigeo, Effect of nonuniform implosion of target on fusion parameters, 11:31072 (RA;JP)
See Arai, Masaru, 11:31071
See Nagata, Norimasa, 11:31073
Kaye, R.J., *See* Cowan, M., 11:30352
Kazama, Yoichi, Introduction to monopole-fermion dynamics, 11:30867 (RA;JP)
Issues in monopole-catalyzed proton decay, 11:30870 (RA;JP)
Kazmerski, L.L., Polycrystalline silicon: Impurity incorporation and passivation, 11:29556 (BA;US)
See Abou-Elfotouh, F., 11:29552
Keane, C., *See* Skinner, C.H., 11:31078
Keavney, C.J., *See* Spitzer, M.B., 11:29518
Keene, F.R., Reduction of carbon dioxide by tris(2,2'-bipyridine) cobalt(I), 11:30225 (J;NL)
Keesee, R.G., *See* Upschulte, B.L., 11:30212
Keller, G.R., *See* Hinze, W.J., 11:29622
Kelley, J.J., *See* Chreitzberg, A.M., 11:29943
Kelly, R., *See* Bradley, F.J., 11:29408
Kelsey, J.R., Drilling technology/GDO, 11:29635 (RA;US)
Kemner, W., *See* Carvitti, J., 11:29741
See Rosbury, K.D., 11:30533
Kendall, H., *See* Johnson, A.S., 11:30477
Kende, H., *See* Salter, S.O., 11:30676
Kennedy, J.H., *See* Anderman, M., 11:30295
Kennedy, W.E. Jr., *See* McKenzie, D.H., 11:29446
Kennel, E., Current damage situation in Bavaria, 11:30706 (RA;DE;In German)
Kenney, V., *See* Ruchti, R., 11:30474
Kent, L.R., Emergency containment system, 11:29439 (RA;US)
Kephart, R., *See* Yarema, R.J., 11:30471
Keraenen, H., *See* Aalto, A., 11:29675
Kerbel, G.D., *See* Harvey, R.W., 11:30994
Kercher, J.R., Forecasting effects of SO_2 pollution on growth and succession in a western conifer forest, 11:30728 (J;US)
Kerchner, H.R., Characterization of the National Low-Temperature Neutron Irradiation Facility, 11:29818 (R;US)
Kerstiens, F.I., Tritium Systems Test Assembly Quality Assurance Program, 11:31201 (J;US)

Tritium Systems Test Assembly operator training program, 11:31202 (J;US)
Kestel, B.J., *See* Loomis, B.A., 11:30084
Kesternich, W., *See* Packan, N.H., 11:30088
Kevala, R.J., *See* Dowgiallo, E.J., 11:30058
Kevan, L., *See* Jones, R.R.M., 11:30242
Kevern, N.R., *See* Nelson, D.J., 11:30607
Kewish, R.W., *See* Rej, D.J., 11:31263
See Siemon, R.E., 11:31264
Khair-El-Din, A.E.H.M., Energy conservation and its implication for architectural design and town planning in the hot-arid areas of Saudi Arabia and the US Gulf States, 11:29589 (RA;US)
Khalifa, A., *See* Gari, H., 11:29567
Khalifa, A.M.A., Cookers for solar homes, 11:29591 (RA;US)
Khan, I., *See* Bohr, H., 11:30858
Khan, M.R., Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures, 11:29158 (R;US)
Khanaka, G.H., Propagation of long, high-power microwave pulses through the air, 11:30331 (R;US)
Khatibu, M., Biogas technology for water pumping in Botswana, 11:29464 (RA;DE)
Kibbler, A., *See* Blakeslee, A.E., 11:29525
Kibler, J.E., *See* Muller, D.C., 11:30748
Kidnay, A.J., *See* Yesavage, V.F., 11:29178
Kiel, D., Air leakage flow correlations for varying house construction types, 11:30002 (R;US)
Kiernan, R.J. Jr., *See* Martin, R.E., 11:29763
Kiessling, R., Multiple constant power discharge tester, 11:29897 (RA;US)
Kifune, T., Point source of very high energy gamma ray, 11:30771 (RA;JP)
Kikuchi, M., Note on the Mirnov signal analysis in tokamaks, 11:30992 (J;AT)
Kilical, A.A., Traditional methods for energy conservation in dwelling units, 11:30006 (RA;US)
Kilpatrick, S.J., Characterization of the TFTR plasma edge by Langmuir-calorimeter probes, 11:30980 (R;US)
Kim, D., Temperature history for canistered fuel lag storage areas during the loss of cooling air at the receiving and handling building of the MRS Facility, 11:29302 (R;US)
Kim, J., Modeling of non-Gaussian beamlet profile based on total-beam power loss and transmission, 11:30999 (J;US)
See Hong, R., 11:31207
Kim, K., State of in situ stresses determined by hydraulic fracturing at the Hanford Site, 11:29415 (R;US)
Kim, K.J., *See* Park, S.Y., 11:31269
Kim, S., *See* Ehst, D.A., 11:31197
See Turner, L.R., 11:31164
Kim, S.H., *See* El-Genk, M.S., 11:29864
Kimura, R.T., *See* Delegard, C.H., 11:30616
Kindle, C.H., *See* Robertus, R.J., 11:29628
King, C. J., Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
King, C.E., *See* McKinnon, M.A., 11:29303
King, L.J., *See* Benker, D.E., 11:29292
See Bigelow, J.E., 11:30308
King, R.B., Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+\text{-}CH_3N(PF_2)_2]_2(\mu\text{-}PF_2)(\mu\text{-}Cl)Mo(CO)(PF_2NHCH_3)$, 11:30231 (J;US)
King, W.T., *See* Mihalczo, J.T., 11:30335
Kinoshita, K., Stabilizing solidification I: a method of immobilization of radioactive waste involving volume reduction, 11:29345 (RA;US)
Kinsey, J.S., *See* Cowherd, C. Jr., 11:30532
Kipouros, G.J., Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
Kirby, L.J., *See* Toste, A.P., 11:29422
Kirchner, W., *See* Ernstsson, G., 11:29918
Kirner, N.P., Through the regulatory hoop, 11:29322 (RA;US)
Kirsten, F.A., MARK II end cap calorimeter electronics, 11:30470 (J;US)
Kisner, R.A., State and data techniques for control of discontinuous systems, 11:29809 (R;US)
Kispert, L.D., Electron spin echo studies of donor-doped poly(p-phenylene) and its oligomers, 11:30272 (J;GB)
See Samskog, P.O., 11:30307
Kistiakowsky, V., *See* Johnson, A.S., 11:30477
Kittelson, D., *See* Thimsen, D., 11:29238
Kitts, F.G., *See* Benker, D.E., 11:29292
Kivijaervi, J., Practical properties of ethanol used as a fuel in diesel engine supercharged in different ways, 11:30039 (R;FI;In Finnish)
Klabunde, C.E., *See* Kerchner, H.R., 11:29818
Klavetter, E.A., Fluid flow in a fractured rock mass, 11:30742 (R;US)
Klebesadel, R.W., *See* Baker, D.N., 11:30809
See Laros, J.G., 11:30787
Klecker, B., *See* Mason, G.M., 11:30786
Kleefeldt, K., *See* Tilack, M., 11:31245
Klein, F.H., Validity of cycle life bench test data in relation to real world in-vehicle testing, 11:30059 (RA;US)
Kleman, B., *See* Hartmann, B., 11:30730
Klemm, R.B., *See* Michael, J.V., 11:30209
See Smalley, J.F., 11:30287
Klingner, P.L., *See* Rej, D.J., 11:31263
See Siemon, R.E., 11:31264
Klinkhamer, F.R., Structure in the universe from massive neutrinos, 11:30783 (R;US)
Kloss, R., Model as an instrument for determining the optimal layout of biogas plants with regard to technical and economical aspects, 11:29483 (RA;DE)
See Baader, W., 11:29481
Klosterbuer, S., *See* Schenkel, R., 11:29766
Klueh, R.L., Development of ferritic steels for reduced activation: the US program, 11:30081 (R;US)
Development of austenitic steel for fast induced-radioactivity decay, 11:31053 (RA;US)
Development of ferritic steels for fast induced-radioactivity decay, 11:31063 (RA;US)
Effect of cold work on tensile behavior of irradiated type 316 stainless steel, 11:30086 (R;US)
Miniature tensile test specimens for fusion reactor irradiation studies, 11:31049 (RA;US)
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)
See Corwin, W.R., 11:31061
Kluk, A.F., *See* Wickham, L.E., 11:29332
Kluzinski, C., *See* Bourgault, F., 11:30075
Knapik, J.A., Weighted discharge electrodes - a solution to mechanical fatigue problems, 11:29743 (RA;US)
Knapp, F.F. Jr., *See* Goodman, M.M., 11:30652, 11:30661
See Srivastava, P.C., 11:30651
Knauer, J.B., Glove box operations for transplutonium element production, 11:30336 (R;US)
Knechtli, R.C., *See* Loo, R.Y., 11:29522
Knickerbocker, K.L., *See* Baumbaugh, A.E., 11:30469
Knott, M.J., *See* Turner, L.R., 11:31164
Knox, J.B., Summary report of the workshop on the interactions of climate and energy, 11:30520 (J;US)
Kobayashi, Makoto, Simple picture of Rubakov-Callan effects, 11:30866 (RA;JP)
Koch, M., *See* Zinder, S.H., 11:29487
Kodama, Hideo, Comments on the chaotic inflation, 11:30779 (RA;JP)
See Iji, Teruo, 11:29352
Koester, R., Cementation of radioactive wastes in the Federal Republic of Germany, 11:29377 (RA;US)
Kohse, G., *See* Cohn, D.R., 11:31173
See Megusar, J., 11:31064
Kohut, P., Geometry-independent approach to coarse-mesh neutron diffusion calculations, 11:29793 (R;US)
Koizumi, K., *See* Lue, J.W., 11:31171
Kolb, E.W., *See* Accetta, F.S., 11:30763, 11:30880
Kolibal, J., *See* Ku, L.P., 11:31242
See Liew, S.L., 11:31001
Kolk, B., Studies of defects with the Moessbauer effect, 11:30157 (RA;ZA)
Kollatschny, W., *See* Yorke, H.W., 11:30791
Kollmer, W.E., *See* Meiringer, G., 11:30718
Kolstad, G.A., Geosciences research in DOE - 1985, 11:29909 (RA;US)
Komatsu, H., Mass of superpartners in SGUT, 11:30884 (RA;JP)
Komoto, T.T., *See* Wong, C., 11:31154
Kondepudi, D.K., Weak neutral currents and the origin of biomolecular chirality, 11:30632 (J;GB)
Kondo, K., *See* Yarema, R.J., 11:30471
Koonin, S.E., Microcanonical simulation of nuclear disassembly, 11:30937 (R;US)
Kopia, L.P., *See* Watson, N.D., 11:30426
Kopiske, G., Experiences with a low temperature biogas plant, 11:29479 (RA;DE)
Koploy, M., *See* Madsen, M.M., 11:30350
Kordas, J.F., *See* Kaifer, R.C., 11:30432
Korellis, J.S., *See* Kawahara, W.A., 11:30389

Korenko, M.K., Maraging superalloys and heat treatment processes, 11:30107 (P;US)
Kornblith, L. Jr., Segregation of low-level dry active waste, 11:29365 (RA;US)
Korpela, T., Energy consumption variations in pulp and paper industry, 11:30029 (R;FI;In Finnish)
Kosako, K., *See* Youssef, M.Z., 11:31032
Koshiba, Y., Operational experiences of non-precoated type filters (super fine filter) in PWR and BWR nuclear power plants, 11:29812 (RA;US)
Koski, J.A., Evaluation of cooling channel configurations for actively cooled limiters, 11:31081 (R;US)
The engineering and material aspects of impurity control systems, 11:31139 (J;US)
See Brown, G.W., 11:31251
Koski, P., Calculation of the consumption of electric energy in buildings, 11:29996 (R;FI;In Finnish)
Compensation of reactive power in buildings, 11:29998 (R;FI;In Finnish)
See Ollila, H., 11:30025
Kosky, P.G., *See* Maylotte, D.H., 11:29156
Kosunen, P., Elimination of quality fluctuations of milled peat in transportation phase and cost caused by these fluctuations, 11:29209 (R;FI;In Finnish)
Koszykowski, M.L., *See* Tully, F.P., 11:30251
Kox, S., Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Kozawa, A., *See* Hunter, J.C., 11:30221
Kraemer, K.G., Battery storage test facility for load frequency control and instantaneous reserve, 11:29672 (RA;US)
Utility requirements for battery energy storage and their effects on battery test programs, 11:29670 (RA;US)
See Aust, K.D., 11:29894
Kraemer, R., *See* Guber, W., 11:29356
Krakowski, R.A., Directions for improved fusion reactors, 11:31076 (R;US)
Prospects for improved fusion reactors, 11:31074 (R;US)
See Bathke, C.G., 11:31176
See Copenhaver, C., 11:31175
See Hagenson, R.L., 11:31179
Kramer, D. P., Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Kramer, J.F., *See* Jacob, N.P., 11:29392
See Storton, J.M., 11:29762
Kramer, J.M., *See* Gruber, E.E., 11:30082
Kraner, H.W., *See* Beuttenmuller, R., 11:30423
Krantz, E.A., System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
Krause, A.R., Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
See Brooks, J.N., 11:31163
Kreider, J.F., Solar water heating - recent trends, cost, and performance, 11:29592 (RA;US)
Krigmont, H., Laboratory and full-scale characteristics of electrostatic precipitators with rigid mast electrodes, 11:29707 (RA;US)
Krinsky, S., *See* Yu, L.H., 11:30361
Krishnan, V.S., *See* Ardron, K.H., 11:29776
Krishnaswamy, M.R., Nucleon decay experiment at Kolar Gold Field, 11:30832 (RA;JP)
Krisi, M.E., Thin film coatings for improved alpha/epi, 11:29542 (RA;US)
Krivenski, V., *See* Mazzucato, E., 11:30988
Kroening, H., *See* Hawighorst, A., 11:29842
Kroto, H.W., *See* Zhang, Q.L., 11:30248
Krueger, P.A., *See* Mathew, P.M., 11:30071
Kruger, C.H., *See* Haussmann, G., 11:29217
Ku, L.P., The effectiveness of building wall boration in controlling the neutron responses in a fusion facility, 11:31242 (J;US)
See Liew, S.L., 11:31001
Kubitschek, H.E., *See* Gevertz, D., 11:30699
Kubota, Y., *See* Kawasaki, S., 11:31070
Kucera, P.A., *See* Fuller, R.K., 11:30621
Kuehne, K., *See* Ganander, H., 11:29665
Kuenisch, H.J., *See* Kraemer, K.G., 11:29670
Kugel, H.W., *See* Williams, M.D., 11:31198
Kukacka, L.E., Advanced materials for geothermal energy processes, 11:29630 (RA;US)
Kuleinski, G.L., *See* Sviatoslavsky, I.N., 11:31151
Kulzick, M.A., *See* Zax, D.B., 11:30203
Kumar, A., Radiation effects in vanadium alloys in fusion reactor environments, 11:31057 (RA;US)
Kumar, C.V., *See* Chattopadhyay, S.K., 11:30279, 11:30297
Kumar, K.S., *See* Feldman, P.L., 11:29685
Kumpulainen, J., *See* Azaiez, F., 11:30911
Kung, H.H., *See* Hong, F., 11:30229
Kunsman, D.M., *See* Benjamin, A.S., 11:29862
Kuo, S.P., Distribution of electric fault currents in MHD faraday generators, 11:31267 (BA;US)
Kuo-Petravic, G., Numerical determination of the magnetic field line Hamiltonian, 11:31079 (R;US)
Kuribayashi, H., *See* Koshiba, Y., 11:29812
Kuribayashi, Hiroshi, *See* Iji, Teruo, 11:29352
Kurihara, Yukio, Nuclear collision theory with many-body correlations, 2. Deuteron+deuteron elastic scattering, 11:30893 (R;JP)
Nuclear collision theory with many-body correlations, 1. Formulation, 11:30933 (R;JP)
Kurkela, S., Water chemistry control and analytical methods at medium pressure power plants, 11:29676 (R;FI;In Finnish)
Kuroda, H., Dynamical aspects of the picosecond x-ray generation from laser-produced plasmas, 11:30373 (BA;US)
Kurosaka, N., *See* Koshiba, Y., 11:29812
Kurtz, D.W., Systems approach to the aerodynamic design of electric and hybrid vehicles, 11:30068 (BA;GB)
Kurumada, Norimitsu, *See* Iji, Teruo, 11:29352
Kurylo, M.J., Measurements of the pressure dependence of the HO_2 radical self-disproportionation reaction at 298 K, 11:30207 (J;US)
Kustom, R.L., *See* Misra, B., 11:31146
Kusuki, N., *See* Itoh, R., 11:30453
Kuszmaul, J.S., *See* Gorham-Bergeron, E., 11:29262
Kutzman, R.S., *See* Firriolo, J.M., 11:30548
Kuykendal, W.B., *See* Cowherd, C. Jr., 11:30532
See Duncan, M.W., 11:30529
See Szabo, M.F., 11:29735
Kwon, K.C., Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)

L

Labat, P., Project of the advanced PWR reactor N4, at Chooz, 11:29768 (R;FR;In French)
Lackey, W.J., *See* Caputo, A.J., 11:30130
See Stinton, D.P., 11:30131
Lacoste, J., *See* Bourgault, F., 11:30075
Lacy, R.G., Status of US geothermal industry, 11:29613 (RA;US)
See Nelson, T.T., 11:29627
Laforet, J.J., *See* Philippot, J., 11:29806
Lagage, P.O., Reactor antineutrino background at Gran Sasso, 11:30424 (R;FR)
Lager, D., *See* Johnson, R.R., 11:31084
Lagowski, J., *See* Gatos, H.C., 11:29553
Lai Yaofu, Attempt of the biogas development and utilization. The introduction of the community biogas digesters and biogas distribution to each family in an agricultural research institute, 11:29468 (RA;DE)
Laihonen, P., *See* Lietzen, E., 11:29681
Laine, E.F., Acoustic velocity measurements in materials using a regenerative method, 11:29232 (P;US)
Laine, R., Utilization of chipwood in Lapland. Prehandling, 11:29491 (R;FI;In Finnish)
Wood fuels properties and principles of pricing, 11:29490 (R;FI;In Finnish)
Laird, R., *See* Dawson, J., 11:30448
Laizier, J., Food irradiation: a technology for the eighties, 11:29455 (R;FR)
Lambert, D. R., Rolling cuff flexible bellows, 11:29248 (P;US)
Lamby, E.J., *See* Maylotte, D.H., 11:29156
Lample, G., *See* Fieux, B., 11:30397
Lancaster, C.A., *See* Day, A.C., 11:29529
Lander, G.H., Orbital effects in actinide systems, 11:30114 (BA;US)
Landham, E.C. Jr., Precipitator performance enhancement with pulsed energization, 11:29714 (RA;US)
See Altman, R.F., 11:29717
See Dismukes, E.B., 11:29703
Landis, D.A., A reliable automatic liquid nitrogen filling system, 11:30429 (J;US)
Landwehr, J.P., Reducing electrostatic precipitator power consumption, 11:29739 (RA;US)
Lane, G.D., Design review of the SYVAC Executive, November 1984-February 1985, 11:29440 (R;GB)

Lane, G.S., *See* Baldwin, R.M., 11:29271
Lang, D.D., *See* Turner, W.C., 11:31259
Lang, R.A., *See* Miller, W.R., 11:29154
Langlois, R.G., *See* van den Engh, G.J., 11:30647
Langstaff, R., *See* Dubois, R., 11:30455
Langston-Unkefer, P.J., *See* Lee, T.C., 11:30628
Laniesse, J., *See* Alamo, A., 11:30072, 11:30076
Lankford, A.J., *See* Barklow, T., 11:30462
Lannoy, A., *See* Brossard, J., 11:29798
Lanza, R.C., Mesh chambers for positron emission tomography, 11:30666 (J;US)
Laros, J.G., Soft-spectrum gamma-ray bursts, 11:30787 (RA;US)
LaRosa, P.C., Abscisic acid accelerates adaptation of cultured tobacco cells to salt, 11:30645 (J;US)
Larsen, G.C., Gas explosion characterization, wave propagation (small-scale experiments). Vol. 1, 11:30509 (R;FR)
Gas explosion characterization, wave propagation (half-scale experiments). Vol. 2, 11:30510 (R;FR)
Larsen, R.S., Overview of the data acquisition electronics system design for the SLAC linear collider detector (SLD), 11:30443 (J;US)
Larson, A., *See* Godwin, R., 11:30160
Lasher, L.C., *See* Weeren, H.O., 11:29374
Laster, B.H., *See* Slatkin, D.N., 11:30658
Lau, C.W., *See* Argon, A.S., 11:30118
Laufer, A.H., *See* Kurylo, M.J., 11:30207
Laughlin, J.S., Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
Laurance, W.F., *See* Reynolds, T.D., 11:30571
Laurikko, J., Alcohol as a fuel in a high speed diesel engine with double injection system, 11:30041 (R;FI;In Finnish)
Cold-start tests with speed diesel engines using alcohol as main fuel, 11:30042 (R;FI;In Finnish)
Endurance test of a high speed diesel engine using ethanol fuel, 11:30038 (R;FI;In Finnish)
Laurola, H., *See* Jungerstam, B., 11:30026
Lautensleger, A., Modification of a commercially available ICP for application to radioactive analyses, 11:30506 (J;US)
Law, A.G., Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
See Delegard, C.H., 11:30616
Lawandy, N.M., Theoretical studies of resonance enhance stimulated raman scattering (RESRS) of frequency doubled Alexandrite laser wavelengths in cesium vapor. Semiannual report, 11:30364 (R;US)
Lawless, P.A., Prediction of voltage-current curves for novel electrodes arbitrary wire electrodes on axis, 11:29699 (RA;US)
See Ensor, D.S., 11:30528
Laws, G.L., *See* Alkezweeny, A.J., 11:30547
Lazareth, O.W., *See* Horn, F.L., 11:29824
Lazzara, Ch.P., *See* Miron, Y., 11:29278
Le Claire, R.J., System studies of commercial Tokamak reactors with resistive magnets, 11:31165 (J;US)
Leavitt, S.W., Stable-carbon isotopic composition of maple sap and foliage, 11:30631 (J;US)
Lebeda, C., BUARO PSD vs height, 11:30808 (R;US)
Leblanc, A., Development of tungsten-tantalum generator. Final report, 11:30310 (R;US)
LeBlanc, J.C., *See* Saluja, P.P.S., 11:29312
Leboeuf, C.M., *See* Benner, J.P., 11:29517
Leburton, J.P., *See* Wagner, M., 11:29526
Lechtenberg, T.A., *See* Davis, J.W., 11:31100
See Klueh, R.L., 11:30081
LeClaire, R.J., *See* Yang, T.F., 11:31172
Lee, E.H., *See* Farrell, K., 11:30087
Lee, E.P., *See* Hovingh, J., 11:30409
Lee, G.C.Y., *See* Jensen, R.M., 11:29195
Lee, J.D., Nuclear performance optimization of the Be/Li/Th blanket for the fusion breeder, 11:31133 (J;US)
See Henning, C.D., 11:31123
See Moir, R.W., 11:31103, 11:31143
See Wong, C., 11:31154
Lee, J.K., Finite-beta global MHD stabilities for circular and highly-elongated tokamaks with and without poloidal divertors, 11:30970 (R;US)
Lee, K.L., *See* Kirsten, F.A., 11:30470
Lee, K.T., *See* Hughes, J.M., 11:29704
Lee, L.Y.C., Photoinduced C-C bond cleavage via electron-transfer reactions: visible-light-mediated scission of tertiary amines, 11:30288 (J;US)
Lee, N., Effects of quantum flux density of photosynthesis and chloroplast ultrastructure in tissue-cultured plantlets and seedlings of Liquidambar styraciflua L. towards improved acclimatization and field survival, 11:30679 (J;US)
Lee, S.G., *See* Cline, J.E., 11:30177
Lee, T.C., Pyruvate decarboxylase from Zea mays L., 11:30628 (J;US)
Lee, T.S., *See* Setser, D.W., 11:30264
Lee, V.D., Shield design for next-generation, low-neutron-fluence, superconducting tokamaks, 11:31150 (J;US)
See Brown, T.G., 11:31030
See Strickler, D.J., 11:31186
Lee, W.D., *See* Broach, J.T., 11:30355
Lee, W.H., High explosive modeling in 2D Euler code for shaped charge problems, 11:30511 (R;US)
LeFevre, M.E., Peyer's patch epithelium: an imperfect barrier, 11:30684 (BA;US)
Lefort, A., *See* Cayla, O., 11:30077
Leftwich, V.P., Coal industry perspectives on nonpoint source pollution, 11:29191 (RA;US)
Leggett, P., MARECS and ECS: the first few years in orbit, 11:29507 (RA;FR)
Leggett, S.K., *See* Hawarden, T.G., 11:30792
Lehnert, G., Accelerated life testing of sodium-sulfur cells, 11:30054 (RA;US)
Leigh, J.R., Angular momentum partition in heavy ion induced fission and the effects of shells on gamma-ray multiplicities, 11:30914 (R;AU)
Leith, D., *See* Ashford, V., 11:30449
Leith, D.W.C.S., *See* Bird, F., 11:30478
Lelio, G., *See* Basso, M., 11:29594
Lellouch, D., High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)
Lelong, C., *See* Alamo, A., 11:30072, 11:30076
Lenard, R., *See* Botts, T.E., 11:30404
Lepareux, M., *See* Hoffmann, A., 11:30151
Lerat, J.M., Uranium enrichment by solvent extraction, 11:29289 (R;FR)
Leray, J.L., Activation energies of recovery of the oxide charge created by ionizing pulse, energies being taken related to room temperature during irradiation and related to process oxidation temperature, 11:30150 (R;FR;In French)
Leroux, B., *See* Sicre, A., 11:30927
Leroux, J., Structural analysis of PWR fuel assemblies in LOCA and seismic conditions, 11:29770 (R;FR)
Leroy, C., *See* Labat, P., 11:29768
Lesht, B.M., *See* Shannon, J.D., 11:30525
Lester, D.F., Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions, 11:30784 (R;US)
Leuchtner, R.E., *See* Upschulte, B.L., 11:30212
Leung, P.C.W., *See* Emge, T.J., 11:30245
Leutwiler, N.R., The Mancamp Issue: Toward a good neighbor policy for major energy/minerals developments, 11:29942 (BA;US)
Leventhal, L., Chemical hazards from decontamination solutions in low level waste, 11:29354 (RA;US)
Levi, E., *See* Kuo, S.P., 11:31267
Levine, L.O., *See* Hostick, C.J., 11:30344
Levine, M.D., *See* Turiel, I., 11:29978, 11:30020
Levinson, S.J., Edge turbulence in the PRETEXT Tokamak, 11:31018 (BA;US)
Levy, C.D.P., Status of the optically pumped polarized H^- ion source at TRIUMF, 11:30416 (R;CA)
Lewellan, W.S., Dry deposition model sensitivity, 11:30561 (RA;US)
Lewellen, W.S., Modeling turbulent exchange in forest canopies, 11:30543 (RA;US)
See Varma, A.K., 11:30562
Lewin, E.E., Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
Lewis, A. E., *See* Mallon, R. G., 11:29265
Lewis, A.E., *See* Braun, R.L., 11:29268
Lewis, A.R., Costs of reservoir releases aeration, 11:29495 (R;US)
Lewis, C.R., *See* Werthen, J.G., 11:29521
Leyer, J.C., *See* Brossard, J., 11:29798
Lhospice, G., *See* Haddad, M., 11:30925
Li, S.B., DLTS analysis of radiation-induced defects in one-MeV electron irradiated germanium and Alsub0.17Gasub0.83As solar cells, 11:29534 (RA;US)
Li, S.S., *See* Loo, R.Y., 11:29522
Liang, J., FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3, 11:30214 (J;US)
Liatard, E., X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus, 11:30912 (R;FR;In French)
Libowitz, G.G., Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)

Lichtenberger, D.L., Comparison of thionitrosyl and nitrosyl bonding in dicarbonyl(eta^5-cyclopentadienyl)chromium complexes by gas-phase ultraviolet and x-ray photoelectron spectroscopy, 11:30266 (J;US)
Lidiak, E.G., *See* Hinze, W.J., 11:29622
Liese, T., Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)
Lietzsen, E., Fouling control in cooling systems using brackish water, 11:29681 (R;FI;In Finnish)
Lieven, T., *See* Boncoeur, M., 11:30120
Liew, S.L., Shielding analysis for the horizontal x-ray imaging system on the TFTR, 11:31001 (J;US)
See Ku, L.P., 11:31242
Likos, W.E., The effect of alcohol fueling on diesel engine durability, 11:30046 (B;US)
Lillestolen, T., *See* Davis, W.T., 11:29731
Lillie, R.A., Neutronics calculations in support of the ORR-MFE-4A and -4B spectral tailoring experiments, 11:31043 (RA;US)
Lilly, W., *See* Calo, J.M., 11:29160
Lim, T., *See* Rengan, K., 11:29804
Lim, Y.K., *See* Chew, C.K., 11:30860
Lin, J., *See* Rengan, K., 11:29804
Lin, W., In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Linak, W.P., *See* Peterson, T.W., 11:29186
Lindberg, S.E., Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States, 11:30524 (R;US)
Lindman, B., *See* Joensson, B., 11:29213
Lindsay, J., *See* Batley, R., 11:30485
Lindsjoe, L., *See* Almqvist, P., 11:29223
Liner, Y., *See* Chow, C.K., 11:30119
Linford, R.K., *See* Siemon, R.E., 11:31264
Ling, K.S., *See* Yeh, Y.C.M., 11:29528
Linsalata, P., Plutonium and radiocesium in the water column of the Hudson River Estuary, 11:30619 (J;US)
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Lipfert, F.W., Statistical analysis of relationships between precipitation chemistry and air quality in New Hampshire and precursor emissions, 11:30553 (J;US)
Urban and local source effects on precipitation chemistry, 11:30552 (J;US)
Lippert, T.E., Evaluation and development of candidate high temperature filter devices for pressurized fluidized bed combustion, 11:29687 (RA;US)
See Ciliberti, D.R., 11:29688
Lippincott, E.P., *See* Guthrie, G.L., 11:29750
Lippmann, M.J., Brine injection studies, 11:29912 (RA;US)
Geothermal reservoir technology, 11:29614 (RA;US)
Lisbona, N., *See* Barros, S. de, 11:30928
Liss, T.M., *See* Drake, G., 11:30468
Listvinsky, G., *See* Cohn, D.R., 11:31173
Little, J.W., Radiative decay of surface plasmons on nonspherical silver particles, 11:30115 (BA;US)
Little, W.W., *See* Mullen, M.F., 11:29753
Littlewood, R., *See* Castle, G.S.P., 11:29694
Littman, M.G., *See* Clark, C.W., 11:30365
Litwin, C., *See* Maron, Y., 11:31019
Liu, B.Y.H., *See* Thimsen, D., 11:29238
Liu, C.C., *See* Kuo, S.P., 11:31267
Liu, G., Photovoltaic array simulation, 11:29511 (RA;FR)
Liu, K.C., In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 11:30090 (R;US)
Liu, Q., *See* Choppin, G.R., 11:30320
Liu, Y., *See* Tilack, M., 11:31245
See Zhang, Q.L., 11:30248
Liu, Y.Y., Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Liv, Y.Y., Solid breeder/structure mechanical interaction and thermal stability, 11:31137 (J;US)
Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiA1O_2$ solid breeders with and without irradiation effects, 11:31255 (J;US)
Livengood, C.D., *See* Garvey, D.B., 11:29214
Livingston, R.A., *See* Beatty, R.N., 11:29811
Llewellyn, G.H., Computer simulation of quenching uranium-0.75% titanium penetrator blanks. Final report for FY 1984, 11:30106 (R;US)
Llory, M., *See* Fontaine, J.P., 11:29780
Loblitz, D.W., Aeroelastic effects in the structural dynamic analysis of vertical axis wind turbines, 11:29664 (R;US)
Loewenstein, W.B., Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
Logan, B.G., *See* Henning, C.D., 11:31123
See Nelson, W.D., 11:31129
See Perkins, L.J., 11:31168
Lokken, R.O., *See* Treat, R.L., 11:29379
London, R.E., *See* Unkefer, C.J., 11:30655
Long, A., *See* Leavitt, S.W., 11:30631
Long, G., *See* Alper, B., 11:29566
Long, G.L., *See* McCreary, T.W., 11:30238
Longmire, J.L., *See* Stallings, R.L., 11:30724
Loo, B.W., A new Compton densitometer for measuring pulmonary edema, 11:30665 (J;US)
Loo, R.Y., Evaluation of AlsubxGasub1-xsubAs solar cells, 11:29522 (RA;US)
See Li, S.B., 11:29534
Loomis, B.A., Solute segregation and microstructural evolution in ion-irradiated vanadium-base alloys, 11:30084 (R;US)
Solute segregation and void formation in ion-irradiated vanadium-base alloys, 11:31056 (RA;US)
Lopez, E.A., *See* Nyhan, J.W., 11:29404
Loponen, M., Comparison of laboratory, dynamometer and road tests of an EV, 11:30060 (RA;US)
Lorenz, R.A., Effects of time and other variables on fission product release rates, 11:29748 (R;US)
See Osborne, M.F., 11:29855
Lorrain, C., *See* Lerat, J.M., 11:29289
Loureiro, J., *See* Ferreira, C.M., 11:30977
Lousteau, D.C., *See* Nelson, W.D., 11:31129
See O'Toole, J.A., 11:31128
Love, W., *See* Niemeyer, J.W., 11:29710
Lovell, J.B., *See* Watson, N.D., 11:30426
Lovesey, S.W., Collective motions in dense fluids observed in neutron scattering, 11:30949 (R;GB)
Lowden, R.A., *See* Stinton, D.P., 11:30143
Lowther, J.E., *See* Allen, A.M.T., 11:30158
Lozes, G., *See* Dion, L., 11:30073
Lubaszewski, R.T., *See* Cline, J.E., 11:30177
Lubell, M.S., *See* Lue, J.W., 11:31171
Luc-Koenig, E., *See* Wyart, J.F., 11:30966
Lucha, W., Proton decay: theory versus experiment, 11:30877 (R;AT)
Ludlam, T.W., *See* Beuttenmuller, R., 11:30423
Ludtka, G.M., *See* Llewellyn, G.H., 11:30106
Lue, J.W., Partial-array test results in IFSMTF, 11:31171 (J;US)
Luhmann, N.C., *See* Park, H., 11:31015
Lujan, R.E., *See* Copenhaver, C., 11:31175
Luke, P.N., *See* Pehl, R.H., 11:30481
Lundberg, H., *See* Silfvast, W.T., 11:30372
Lundberg, L.B., *See* Anderson, C.A., 11:30162
Luner, C., *See* Trevorrow, L.E., 11:29337
Luther, F.M., *See* Ellis, J.S., 11:30810
Luton, J.N., *See* Lue, J.W., 11:31171
Luxon, J., *See* Hoffman, D.J., 11:31028
Luxon, J.L., Big Dee - A flexible facility operating near breakeven conditions, 11:31119 (J;US)
Luzar, M., *See* Thayer, A.M., 11:30239
Lyall, L.W., *See* Shewfelt, R.W.S., 11:30070
Lynch, C.E., NO/sub x/ control efforts increase, 11:30624 (RA;US)
Lyons, T., *See* Johnson, A.S., 11:30477

M

Ma, M.S., New York State interim waste management cost evaluation, 11:29323 (RA;US)
MacCracken, M.C., Design and use of zonally-averaged climate models, 11:30519 (R;US)
See Knox, J.B., 11:30520
MacGlashan, D.W. Jr., Test of a theory relating to the cross-linking of IgE antibody on the surface of human basophils, 11:30626 (J;US)
Machen, D.R., The FASTBUS Segment Extension as a crate coupling concept, 11:30463 (J;US)
MacKenzie, D.R., *See* Siskind, B., 11:30079
MacKenzie, I.K., Influence of electron momentum on the shape of backscatter peaks in gamma-ray spectrometers, 11:30483 (J;NL)
MacKenzie, P. D., *See* King, C. J., 11:30031
Mackey, H.E. Jr., *See* Jensen, J.R., 11:30595, 11:30620
Mackey, L., Washington State Solar Bank Program. Special report: interim evaluation of the solar bank program, 11:29606 (R;US)

Macklin, J.J., *See* Silfvast, W.T., 11:30372
Maclaine-cross, I.L., Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests, 11:29603 (R;US)
Madarame, H., *See* Garner, J.K., 11:31152
See Gierszewski, P., 11:31158
Madden, N.W., *See* Landis, D.A., 11:30429
Madey, R., Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985, 11:30237 (R;US)
Madia, A., *See* Johnson, E. A., 11:30267
Madiath, J., Community biogas programmes of Gram Vikas, 11:29472 (RA;DE)
Madix, R.J., *See* Hamza, A.V., 11:30216
Madlock, D.E., *See* Brackenbush, L.W., 11:30440
Madrame, H., The influence of leakage currents on MHD pressure drop, 11:31113 (J;US)
Madsen, M.M., Testing of the DHLW truck shipping cask, 11:30350 (R;US)
Maeder, P.F., *See* Nikitopoulos, D.E., 11:30377
Maekawa, H., *See* Bennett, E.F., 11:31157
Magalhaes, S.D. de, *See* Barros, S. de, 11:30928
Magistocchi, L., *See* Basso, M., 11:29594
Magnaud, J.P., TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
Mahato, B.K., Performance testing of advanced lead-acid batteries for electric vehicles, 11:30053 (RA;US)
Mailen, J.C., *See* Benker, D.E., 11:29292
Maison, J.M., *See* Azaiez, F., 11:30911
Majenski, S., *See* Caffrey, A.J., 11:30472
Major, E., *See* Stow, S.H., 11:29376
Majewski, S., Radiation damage test of barium fluoride scintillator, 11:30495 (J;NL)
Major, K.A., *See* Davies, P.G., 11:29643
Majumdar, S., Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)
See Cha, Y.S., 11:31105
See Ehst, D.A., 11:31197
Mako, P.F., *See* Miller, W.R., 11:29154
Malanchuk, J.L., Exploration of the relationships among acidic deposition, land use, and water chemistry, 11:30578 (R;US)
Malhe, V., *See* Jones, G. II., 11:30291
Maldonado, R., *See* Jones, R.R.M., 11:30242
Malhotra, N., *See* Gupta, R.K., 11:30908
Mallen, A.N., *See* Wulff, W., 11:29828
Mallon, G.J., *See* Malanchuk, J.L., 11:30578
Mallon, R. G., Combustion heater for oil shale, 11:29265 (P;US)
Mallory, C.W., Integration of interim storage and the permanent disposal of low-level radioactive waste, 11:29336 (RA;US)
Modularized system for disposal of low-level radioactive waste, 11:29342 (RA;US)
Mamantov, G., *See* Chapman, D.M., 11:30244
Mancini, T.R., Innovative point-focus concentrator projects, 11:29608 (R;US)
Mandet, F., *See* Boncoeur, M., 11:30120
Maninger, R.C., Qualitative comparisons of fusion reactor materials for waste handling and disposal, 11:31212 (J;US)
Mann, W.A., K-meson production by nu/sub μ/-deuterium reactions near threshold: implications for nucleon-decay searches, 11:30824 (R;US)
Mann, W.B.,IV, *See* Solley, W.B., 11:30603
Mannaa, A., *See* Gari, H., 11:29567
Mannelli, I., *See* Batley, R., 11:30485
Manogue, J.E., *See* Gervasi, M., 11:29737
Manory, R.R., Effect of argon and hydrogen on deposition of silicon from tetrachlorosilane in cold plasmas, 11:30123 (R;US)
Manos, D.M., *See* Kilpatrick, S.J., 11:30980
Mans, R.J., Episomal DNA as a molecular probe of cytoplasmic male sterility in S Zea mays, 11:30650 (BA;US)
Maple, M.B., Phenomena involving magnetic moment suppression, 11:30953 (BA;US)
Marchant, D.D., Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Marchant, G.H. Jr., *See* Dahlin, R.S., 11:29701
Marcolli, C.F., *See* Francocci, G.F., 11:29819
Marcus, R.A., *See* Cave, R.J., 11:30240
Margolies, D.S., *See* Turner, W.C., 11:31259
Markovic, V., *See* Neta, P., 11:30252
Marks, T.J., Supported f-element complexes: surface chemistry and catalysis. Final report, August 15, 1984-January 14, 1986, 11:30195 (R;US)
See Bruno, J.W., 11:30318
Marmar, E.S., *See* Rice, J.E., 11:31021
Maron, Y., Transverse electric fields inferred from electron losses and ion beam dynamics in a Magnetically Insulated Diode, 11:31019 (BA;US)
Maroni, V.A., *See* Curtiss, L.A., 11:30211
Marr, J.J., *See* Battles, J.E., 11:29898
Marsala, R.J., *See* Efthimion, P., 11:31004
Marshall, B.W. Jr., Hydrogen:air:steam flammability limits and combustion characteristics at intermediate scale, 11:29861 (R;US)
Marshall, R.W., *See* Henderson, J.D., 11:29384
Martin, G.D., *See* Williams, M.D., 11:31198
Martin, G.F., Report to the NRC on guidance for preparing scenarios for emergency preparedness exercises at nuclear generating stations. Draft report for comment, 11:29851 (R;US)
Martin, J.W., The METC underground coal gasification research program for eastern bituminous coals, 11:29170 (B;US)
Martin, R., *See* Hannifan, M., 11:29593
Martin, R.E., Radiation protection features of Beaver Valley, 11:29763 (RA;US)
Martin, W.J., *See* Peterson, S.R., 11:29441
Martinelli, M., *See* Pinchera, G.C., 11:30527
Martinez, G., *See* Sicre, A., 11:30927
Martinez, R., *See* Hernandez, E., 11:29596
Martinez, T., *See* Yates, G.J., 11:30494
Martins, J.L., Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
Marton, J., *See* Breunlich, W.H., 11:31077
Martyn, J., Energy use in the service sector in the United Kingdom, 11:29954 (RA;US)
Martz, H.F., Comparison of three methods for calculating lower confidence limits on system reliability using binomial component data, 11:29876 (J;US)
Marzouk, A., *See* Sunderman, F.W. Jr., 11:30654
Mason, G.M., Heavy ion compositional signature in ^{3}He-rich solar particle events, 11:30786 (R;US)
Mason, G.R., *See* Dubois, R., 11:30455
Massey, R.S., Status of the ZT-40M RFP experimental program, 11:31177 (J;US)
Masson, J., *See* Fieux, B., 11:29512
Masson, L.S., Tokamak Fusion Core Experiment (TFCX) special-purpose remote maintenance systems, 11:31114 (J;US)
Masuda, S., Bipolar current probe for diagnosing full-scale precipitators, 11:29721 (RA;US)
Ceramic-made boxer-charger for precharging applications, 11:29713 (RA;US)
Pulse energization system of electrostatic precipitator for retrofitting application, 11:29705 (RA;US)
Masuzaki, M., *See* Kawasaki, S., 11:31070
Mathew, P.M., Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
Mathews, L.H., Texas goes it alone: political and legal considerations, 11:29320 (RA;US)
Matis, H.S., *See* Bolton, R.D., 11:30491
Matlock, D.K., *See* Edwards, G.R., 11:31234
Matsui, M., *See* Busing, W.R., 11:30116
Matsumoto, T., Infrared observation of the early universe, 11:30776 (RA;JP)
Mattas, R., *See* Post, D.E., 11:31138
Mattas, R.F., *See* Brooks, J.N., 11:31161, 11:31163
See Gohar, Y., 11:31135
See Krauss, A.R., 11:31236
See Kumar, A., 11:31057
Matthews, C., Strategy and need: DOE's hazardous waste program, 11:29333 (RA;US)
Mattoni, A., *See* Catena, C., 11:30691
Matty, J.M., Scale control in geopressured energy production, 11:29636 (RA;US)
Matsumoto, Zyun-itiro, *See* Katakura, Junichi, 11:30913
Maurel, M., *See* Ashgar, M., 11:30924
Mauser, J.E., *See* White, J.C., 11:29277
Maxon, H., Thyroid effects, 11:30695 (RA;US)
Maxwell, B.P., Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses, 11:29215 (R;US)
Generic studies of advanced fluid bed air heater technology. Topical report

Number 6. Costs and economic analyses of the generic fluid bed air heater systems, 11:29216 (R;US)
May, E., *See* Dawson, J., 11:30448
May, R.A., *See* Bateman, V.I., 11:30345
Maya, I., High efficiency heat transport and power conversion system for cascade, 11:31216 (J;US)
See Sager, G., 11:31000
See Sager, G.T., 11:31003
See Wong R.F., 11:31104
Mayer, E., Use of geoclimatic data for the determination of building characteristics in the north of the Venezuelan Republic, 11:29598 (RA;US)
Mayer-Schwinning, G., Conditioning of power station flue gases to improve electrostatic precipitator efficiency, 11:29702 (RA;US)
Mayhall, J., *See* Brown, T.G., 11:31030
Mayinger, F., *See* Hawighorst, A., 11:29842
Maylotte, D.H., Computed tomography of coals. Quarterly technical progress report No. 8, July 1-September 30, 1984, 11:29156 (R;US)
Mayo, S.L., *See* Brunschwig, B.S., 11:30292
Maziasz, P.J., Assessment of helium effects on swelling by reirradiation in FFTF of Path A alloys previously irradiated in HFIR, 11:31048 (RA;US)
Reirradiation in FFTF of swelling-resistant Path A alloys previously irradiated in HFIR, 11:31047 (RA;US)
Test matrices for irradiation of Path A Prime Candidate and developmental alloys in FFTF, 11:31046 (RA;US)
See Klueh, R.L., 11:30080, 11:30086, 11:31053
Mazumdar, S., Charge and spin density waves in charge-transfer solids, 11:30269 (J;GB)
Mazumder, M.K., *See* Clark, W.T. III, 11:29744
Mazzucato, E., Electron cyclotron heating at down-shifted frequencies in existing tokamak devices, 11:30988 (J;AT)
McAuley, W.A., Load-cell-based weighing system for weighing 9.1 and 12.7-tonne UF_6 cylinders, 11:29452 (R;US)
McBrayer, J.F., Institutional and technical issues in the management of low-level mixed wastes, 11:29329 (RA;US)
McBride, A.F., *See* Stone, R.S., 11:29854
Mccarthy, C., *See* Haines, J.E., 11:29510
McCarthy, D., *See* Peterson, M.E., 11:29410
McCarthy, J.P., *See* Merrill, R.M., 11:30164
McCarville, T.J., *See* Meier, W.R., 11:31210
See Wolfer, W.G., 11:31249
McCaul, C., *See* Ostrow, S.L., 11:29747
McClellan, R.O., Role of inhalation studies with animals in defining human health risks for vehicle and power plant emissions, 11:29227 (J;US)
McClure, J.D., Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)
McConnell, J.W., Jr., Metallographic examination of EPICOR-II liners from Three Mile Island, 11:29362 (RA;US)
McConnell, J.W. Jr., Degradation of resins in EPICOR-II prefilters from Three Mile Island, 11:30154 (RA;US)
McConnell, P., Failure assessment techniques to ensure shipping container integrity, 11:30347 (R;US)
McCormick, E.D., *See* Fife, K.W., 11:29294
McCourt, P., Analysis of photosynthetic antenna function in a mutant of Arabidopsis thaliana (L.) lacking trans-hexadecenoic acid, 11:30630 (J;US)
McCoy, L.R., *See* Gay, R.L., 11:30189
McCoy, M.G., *See* Harvey, R.W., 11:30994
McCrank, G.F.D., Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
McCreary, T.W., Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
McCulloch, W.H., Estimated burst power requirements for selected SDI missions, 11:30346 (R;US)
McDaniel, E.W., *See* Tallent, O.K., 11:29409
See Weeren, H.O., 11:29374
McDannel, M., *See* Nylander, J., 11:29684
McDonald, B., *See* Nylander, J., 11:29684
McDonald, J., Proton decay via d=5 gluino dressed graphs with flavour diagonal gluino couplings in supergravity models, 11:30859 (R;XA)
McDonald, J.M., *See* Smith, M.F., 11:31238
McDonald, M., *See* Levy, C.D.P., 11:30416
McDonald, S., *See* Ottinger, P.F., 11:31020
McDowell, W.J., Alpha counting and spectrometry using liquid scintillation methods, 11:30312 (R;US)
McElroy, D.L., Thermophysical properties of industrial insulators, 11:30021 (J;GB)
McElroy, J.L., *See* Bjorklund, W.J., 11:29411
McGarry, E.D., *See* Guthrie, G.L., 11:29750
McGaughey, P.L., *See* Sunier, J.W., 11:30490
McGee, G.R., *See* Ardron, K.H., 11:29776
McGhee, D.G., *See* Turner, L.R., 11:31164
McGoff, D.J., *See* Reilly, J.K., 11:29831
McGowan, L.J., The effect of residual carbon on adsorption of organic compounds by retorted oil shale, 11:29285 (BA;US)
McGrath, R.N., Operating experience of a mobile waste shredding system, 11:29347 (RA;US)
McGuinn, E.J., Structural analysis of TMI-2 defueling canisters, 11:29759 (RA;US)
See Childress, P.C., 11:29761
McIlrath, T.J., *See* Bonin, K.D., 11:30370, 11:30375
See Clark, C.W., 11:30365
McIntosh, T.W., *See* Reilly, J.K., 11:29831, 11:29832
McKay, R., *See* Crawley, H.B., 11:30467
McKee, R.A., Microstructures and growth rates of FeS on pure and not-so-pure iron, 11:30227 (J;US)
McKenna, K.F., *See* Rej, D.J., 11:31263
See Siemon, R.E., 11:31264
McKenna, M., *See* Rajan, O.A., 11:30280
McKenzie, D.H., Relevance of biotic pathways to the long-term regulation of nuclear waste disposal. Estimation of radiation dose to man resulting from biotic transport: the BIOPORT/MAXI1 software package. Volume 5, 11:29446 (R;US)
See Swartzman, G.L., 11:30614
McKinnon, M.A., BWR spent fuel storage cask performance test. Volume 1. Cask handling experience and decay heat, heat transfer, and shielding data, 11:29303 (R;US)
McKinstry, M., *See* Reiland, P., 11:29905
McLaughlin, B.R., Design and operation of the baghouse at Holcomb Station, Unit No. 1, 11:29732 (RA;US)
McLaughlin, S.B., Relative humidity: important modifier of pollutant uptake by plants, 11:30555 (J;US)
McLean, K.J., Electrical characteristics of large-diameter discharge electrodes in electrostatic precipitators, 11:29718 (RA;US)
Mcleod, P.S., *See* Partain, L.D., 11:29524
McMahan, A.K., Structural transitions and metallization in compressed solid argon, 11:30167 (J;US)
McMahon, J.J., Surface Raman scattering and electrochemistry of iron protoporphyrin IX at a polycrystalline silver electrode, 11:30282 (J;US)
McMenamin, J.S., Models of the US service sector, 11:29971 (RA;US)
McNally, J.R., Cold fusion and graser prospects, 11:31257 (J;US)
McNeely, J.B., GaAsP on GaP top solar cells, 11:29523 (RA;US)
McNeilly, D.R., Noise isolation system for high-speed circuits, 11:30401 (P;US)
McNutt, B.D., Patterns of vehicle misfueling in 1981 and 1982: where, when, what vehicles, and how often?, 11:30044 (B;US)
McShurley, D., *See* Ashford, V., 11:30449
See Bird, F., 11:30478
Mcternan, E.M., *See* Dockter, L., 11:29171
McVey, B.D., *See* Goldstein, J.C., 11:30363
McWhorter, D.B., Liquid and vapor transport coefficients for retorted oil shale, 11:29284 (BA;US)
Meakin, J.D., *See* Birkmire, R.W., 11:29550
Meddi, F., *See* Beuttenmuller, R., 11:30423
Medley, S.S., *See* Cecil, F.E., 11:30978
Meek, Th. T., Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Meeker, D.J., A high efficiency I.C.F. driver employing magnetically confined plasma rings, 11:31225 (J;US)
Meger, R.A., *See* Ottinger, P.F., 11:31020
Megusar, J., Rapid solidification of candidate ferritic steels, 11:31064 (RA;US)
Meier, A.K., Monitored energy performance of new and retrofitted buildings: some results from the BECA data compilations, 11:29967 (RA;US)
See Busch, J.F., 11:30001
Meier, W.R., An ICF Tritium production reactor, 11:31210 (J;US)

Blanket optimization studies for cascade, 11:31162 (J;US)
ICF reactor economics: identifying the high leverage design features, 11:31231 (J;US)
See Hoffman, N.J., 11:31221
Meiringer, G., Cadmium retention in the kidneys of chicks as influenced by phytate in the feed, 11:30718 (R;DE;In German)
Meisburger, J., *See* Atencio, L.G., 11:30480
Melendres, C.A., *See* McMahon, J.J., 11:30282
Melinder, Aa., Secondary refrigerants for heat pump applications. Studies of thermodynamic properties and corrosion, 11:29990 (R;SE;In Swedish)
Melius, C.F., *See* Tully, F.P., 11:30251
Mellanby-Lee, H., Physical coal beneficiation and electricity costs, 11:29210 (R;GB)
Memory, J.D., *See* Fornes, R.E., 11:30145
Mendelsohn, M.H., *See* Krauss, A.R., 11:31236
Mendelsohn, M.L., Prospects for cellular mutational assays in human populations, 11:30723 (BA;US)
Menon, M.G.K., *See* Krishnaswamy, M.R., 11:30832
Meot-Ner , M., Temperature effects on rates of dehalogenation of aromatic anion radicals, 11:30258 (J;US)
Merkel, B., *See* Haldeman, M., 11:30466
Merkle, J.G., *See* Bryan, R.H., 11:29796
Merrell, G.B., *See* Sutherland, A.A., 11:29444
Merrill, R.M., Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Merrill, T.J., *See* Kaifer, R.C., 11:30432
Merry-Libby, P., *See* Stull, E.A., 11:29339
Merry-Libby, P.A., *See* Trevorrow, L.E., 11:29337
Meshkov, N.K., *See* Trevorrow, L.E., 11:29337
Metz, D.D., *See* Piraino, M., 11:29458
Mewes, D., *See* Hawighorst, A., 11:29842
Meyer, J.E., *See* Nakagawa, Y., 11:31253
Meyer, R.A., *See* Rengan, K., 11:29804
Meyer, W.H., *See* Stewart, M.E., 11:30984
Meyer, W.T., *See* Crawley, H.B., 11:30467
Meyers, A., *See* Bowles, K.J., 11:30144
Meyers, S., Regulatory framework for future particulate technology needs, 11:30564 (RA;US)
Meyers, W.J., *See* Hanson, G.N., 11:30758
Micca, P.L., *See* Slatkin, D.N., 11:30658
Michael, J.V., Rate constant for the reaction H + NH_3 over the temperature range 750-1777 K, 11:30209 (J;US)
Michel, H.V., *See* Alvarez, W., 11:30573
Michelotti, L., Introduction to the nonlinear dynamics arising from magnetic multipoles, 11:30412 (R;US)
Micic, O.I., *See* Nedeljkovic, J.M., 11:30289
Mihalczo, J.T., Subcriticality measurements for two coupled uranyl nitrate solution tanks using ^{252}Cf-source-driven neutron noise analysis methods, 11:30335 (R;US)
Miin, T.C., *See* Ross, D.S., 11:29163
Mikkelsen, D.R., Neutral beam orientation on the Tokamak Fusion Test Reactor, 11:31008 (J;US)
Milborrow, D.J., Aerofil characteristics of rotating blades, 11:29657 (RA;DE)
Milde, H., Practical implications of pulse energization of electrostatic precipitators, 11:29706 (RA;US)
Miles, R., *See* Clark, C.W., 11:30365
Miley, G.H., *See* Gohar, Y., 11:31135
See Sager, G., 11:31000
See Sager, G.T., 11:31003
Miley, G.M., *See* Sutton, W.R., 11:31007
See Welch, D.R., 11:31256
Millar, J.M., Proton and deuterium NMR experiments in zero field, 11:30814 (R;US)
See Thayer, A.M., 11:30239
Miller, A., *See* Leventhal, L., 11:29354
Miller, C.C., *See* Barcalow, J.C., 11:29369
See Neal, T.P., 11:29387
Miller, C.W., *See* Fields, D.E., 11:29778
Miller, D.G., Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
Some comments on multicomponent diffusion: negative main term diffusion coefficients, second law constraints, solvent choices, and reference frame transformations, 11:30198 (J;US)
Miller, D.J., *See* Hawthorne, S.B., 11:30268
Miller, D.R., *See* Giorgi, A.E., 11:29494
Miller, E.K., Evolving directions of PC applications in electromagnetics analysis and design, 11:31288 (R;US)
Miller, H., *See* Baudisch, H., 11:29382
Miller, H.G., *See* Johnston, R.M., 11:30148, 11:30149
Miller, J.B., *See* Strickler, D.J., 11:31186
See Watson, N.D., 11:30426
Miller, J.D., Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Miller, J.R., Design of aggressive superconducting TFCX magnet systems, 11:31169 (J;US)
See Dreesen, D.S., 11:29633
See Henning, C.D., 11:31123
Miller, L.F., *See* Williams, M.L., 11:29821
Miller, L.G., Radiation damage experiments and lifetime estimates for beryllium components in fusion systems, 11:31248 (J;US)
See Deis, G.A., 11:31247
Miller, R.L., Recent progress in stellarator reactor conceptual design, 11:31178 (J;US)
See Bathke, C.G., 11:31176
See Krakowski, R.A., 11:31074, 11:31076
Miller, W.R., Great Plains Coal Gasification Plant start-up and modification report, 11:29154 (R;US)
Millot, J.P., FRAMATOME studies on high conversion water reactor concept, 11:29769 (R;FR)
Mills, A.L., *See* Campbell, D.O., 11:29293
Mills, J., *See* Buschmann, J.C., 11:29194
Milner, E.J., Simulating a small turboshaft engine in real-time multiprocessor simulator (RTMPS) environment, 11:30035 (R;US)
Milora, S.L., *See* Wheaton, J.H., 11:31010
Milroy, R.D., *See* Crawford, E.A., 11:30371
Mines, G.L., *See* Bliem, C.J., 11:29913
See Demuth, O.J., 11:29629
Mirin, A.A., Question of consistent boundary conditions when simulating reversed field pinch dynamics. Revision 1, 11:30986 (R;US)
Miron, Y., Fire hazards of oil shale dust layers on hot surfaces, 11:29278 (BA;US)
Mis, F.J., *See* Zigelman, D.A., 11:29383
Mischke, R.E., *See* Bolton, R.D., 11:30491
Misemer, D.K., *See* Franzen, H.F., 11:30205
Misra, B., Thermal-hydraulic thermomechanical testing of solid breeder blanket modules using microwave energy, 11:31146 (J;US)
See Ehst, D.A., 11:31197
Mizuno, A., *See* Clements, J.S., 11:29693
Mochizuki, T., Experimental and simulation studies on soft-X-ray emission from 0.53 micron-laser irradiated solid targets, 11:30374 (BA;US)
Mock, J.E., Overview of the US Department of Energy Geothermal program, 11:29908 (RA;US)
Moeller, M.P., *See* Martin, G.F., 11:29851
Moen, J., Data collection in the service sector, 11:29964 (RA;US)
Forecast for energy consumption in the service sector, 11:29969 (RA;US)
Moffa, P., Selective heating and separation of isotopes in a metallic plasma, 11:31012 (BA;US)
Mohiuddin, G., *See* Shiao, S.Y., 11:30174
Moir, R.W., Design of a helium-cooled molten-salt fusion breeder, 11:31143 (J;US)
Helium-cooled, flibe breeder, beryllium multiplier blanket, 11:31103 (J;US)
Mokashi, A.R., High-efficiency silicon solar-cell design and practical barriers, 11:29504 (R;US)
Mokler, B.V., Quantitative standard for exposure chamber integrity, 11:30554 (J;US)
Molvik, A.W., ICRF heating of passing ions in TMX-U, 11:30985 (R;US)
Molz, F.J., Store heat underground, 11:29878 (J;US)
Monahu, G., Design considerations to avoid common fly ash conveying problems, 11:29740 (RA;US)
Mondal, N., *See* Dawson, J., 11:30448
Mondal, N.K., *See* Krishnaswamy, M.R., 11:30832
Montano, P.A., In situ study of the hydrogenation of diphenyl ether in the presence of pyrrhotite and H_2S, 11:30257 (J;US)
Montgomerie, B., Unsteady aerodynamics applied to the horizontal axis wind turbine disk, 11:29658 (RA;DE)
Mook Jr., H. A., Pulsed-neutron monochromator, 11:30492 (P;US)
Mooney, J.L., *See* Rabideau, P.W., 11:30261
Moore, D., *See* Byerlee, J., 11:30761
Moore, D. S., Frequency shift measurement in shock-compressed materials, 11:30516 (P;US)
Moore, J.N., *See* Adams, M.C., 11:29620
See Nielson, D.L., 11:29640
Moore, J.R., *See* Nave, S.E., 11:30190
Moore, R.W., *See* Dominguez, R.R., 11:30993
Moos, H.W., *See* Benjamin, R., 11:31016
Moran, K.M., *See* Shephard, L.E., 11:30750

Morel, A., Particle physics and gauge theories, 11:30849 (R;FR)
Morel, J., *See* Perez-Mendez, V., 11:30425
Morel, J.R., *See* Kaplan, S.N., 11:30428
Morgan, D., *See* Tilack, M., 11:31245
Morgan, E., *See* Jacob, N.P., 11:29392
Morgan, J.G., Pulsatile fluidic pump demonstration and predictive model application, 11:29295 (R;US)
Morgan, P., *See* Hinze, W.J., 11:29622
Mori, T., *See* Youssef, M.Z., 11:31032
Morillo, J., Pressure and irradiation effects on transport properties of samarium compounds with instable valence, 11:30155 (R;FR;In French)
Morkoc, H., *See* Fischer, R., 11:30165
Morris, C.L., Evidence for Δ-h components from pion reactions, 11:30938 (BA;US)
See Atencio, L.G., 11:30480
Morris, D.E., Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Morris, D.G., *See* Smith, O.L., 11:29858
Morris, J.A.G., *See* Apsimon, R.J., 11:30450
Morris, J.V., *See* Apsimon, R.J., 11:30450
Morris, J.W. Jr., Design of tough ferritic steels for cryogenic use, 11:30100 (R;US)
See Dietderich, D.R., 11:30342
Morris, M.B., *See* Bonin, K.D., 11:30370, 11:30375
Morris, R., *See* Scott-Monck, J., 11:29538
Morrison, G.W., *See* Forsberg, C.W., 11:29421
Morrow, C., *See* Byerlee, J., 11:30761
Morrow-Jones, C.R., *See* Jones, D.W., 11:30622
Morse, E.C., *See* Meier, W.R., 11:31162
Morthorst, P.E., Electricity use in the public sector - a few examples from Denmark. 11:29962 (RA;US)
Moses, H., *See* Knox, J.B., 11:30520
Moss, C.E., A sophisticated gamma-ray data acquisition system based on an IBM PC/XT computer, 11:30437 (J;US)
Moss, J.M., Spin observables in nucleon-nucleus scattering, 11:30943 (BA;US)
Mote, C.D. Jr., *See* Roblee, J.W., 11:30353
Moulik, T.K., India's experiment with community biogas plants. Case study, 11:29500 (RA;DE)
Mountain, C.M., *See* Hawarden, T.G., 11:30792
Mourgues, A., Versatile computer code for reactor neutronic calculation advances in qualification of the different modules, 11:29794 (R;FR;In French)
Mowrer, F., *See* Dod, R.L., 11:30537
Moya, M.M., Sensor-driven, fault-tolerant control of a maintenance robot, 11:29823 (R;US)
Mrotek, E.N., Rebirth of the lead-acid battery - meeting the electric vehicle challenges of the 1980s, 11:30066 (BA;GB)
Muegel, F., *See* Moir, R.W., 11:31143
Mueller, C.J., Scoping study of the potential effectiveness of an operational safety reliability program in addressing generic safety problems, 11:29860 (R;US)
Mueller, D., *See* Efthimion, P., 11:31004
Mueller, E.H., *See* Desalvo, G.C., 11:29520
Mueller, H., Residual fuel oil markets: the source of changes in resid quality, 11:29237 (RA;US)
Mueller, H.G., *See* von Courbiere, R., 11:30050
Muetterties, E.L., *See* Zax, D.B., 11:30203
Mugnai, A., *See* Wiscombe, W.J., 11:30888
Muhlestein, L.D., *See* Jeppson, D.W., 11:31239
Muhlstein, K.D., *See* Peterson, M.E., 11:29410
Mulera, T.A., *See* Fujieda, I., 11:30461
See Kaplan, S.N., 11:30428
Mulkin, R., *See* Dennis, A.W., 11:29417
Mullen, M.F., Review of light water reactor regulatory requirements. Identification of regulatory requirements that may have marginal importance to risk. Volume 1, 11:29753 (R;US)
Muller, A.J., *See* Reichel, L.W., 11:30298
Muller, D.C., Computer method to detect and correct cycle skipping on sonic logs, 11:30746 (R;US)
Preliminary analysis of geophysical logs from the WT series of drill holes, Yucca Mountain, Nye County, Nevada, 11:30748 (R;US)
Mundy, G., *See* Hodges, C., 11:30452
See Young, C.C., 11:30476
Muninger, R.C., *See* Moir, R.W., 11:31103
Munk, A.C., *See* Stallings, R.L., 11:30724
Munson, D.E., Comparison between predicted and measured south drift closures at the WIPP using a transient creep model for salt, 11:30752 (R;US)
Early results from the thermal/structural in situ test series at the WIPP, 11:30751 (R;US)
Muradian, A., *See* Stephenson, L., 11:29273
Murakami, M., Confinement studies in TFTR, 11:30995 (J;US)
Murphy, G.A., Summary of NUREG-1154: loss of main and auxiliary feedwater event at the Davis-Besse Plant on June 9, 1985, 11:29873 (J;US)
Murphy, H., Hot Dry Rock phase II reservoir engineering, 11:29631 (RA;US)
Murray, J.G., Tokamak arc damage, 11:31005 (J;US)
Murray, K.A., A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor, 11:31222 (J;US)
See Hoffman, N.J., 11:31221
Murthy, N., *See* Moulik, T.K., 11:29500
Musgrave, B., *See* Mann, W.A., 11:30824
Mushrush, G.W., Pyrolysis of model alkyl pyridine compounds, 11:29274 (BA;US)
Musket, R.G., Summary abstract: reduction of tritium permeation through iron using aluminum ion implantation, 11:30113 (J;US)
Mustonen, J.P., *See* Maxwell, B.P., 11:29215
Myer, R., *See* Moffa, P., 11:31012
Myers, B., Operating efficiencies of a Lysholm helical expander for Brayton-cycle heat engines, 11:30407 (R;US)
Mynard, R.C., *See* Copenhaver, C., 11:31175

N

Naegele, N., *See* Breunlich, W.H., 11:31077
Nagano, M., Observation of ultra high energy cosmic rays($>=10^{19}$GeV), 11:30781 (RA;JP)
Nagarajan, V., *See* Fessenden, R.W., 11:30274
Nagashima, Y., Neutrino oscillation, 11:30828 (RA;JP)
Nagata, Norimasa, Simulation of LIB target implosion, 11:31073 (RA;JP)
Nagy, M.E., Asymptotic time dependent neutron transport in multidimensional systems, 11:30944 (R;EG)
Nakabayashi, Y., Coal power plant in Japan, especially in EPDC's case with advanced combustion and cleaning technique, 11:29678 (R;SE)
Nakagawa, M., *See* Youssef, M., 11:31033
See Youssef, M.Z., 11:31032
Nakagawa, Y., Effects of pulsed operation on the lifetime of turbine rotors, 11:31253 (J;US)
Nakahara, J.F., *See* Franzen, H.F., 11:30205
Nakamoto, H., *See* Aoyagi, K., 11:30669
Nakamura, O., Fundamental studies of utility requirement for secondary batteries - lead-acid batteries, 11:29673 (RA;US)
Nakamura, T., *See* Bennett, E.F., 11:31157
Nakano, N., *See* Kuroda, H., 11:30373
Nakasima, Ryuzo, *See* Katakura, Jun-ichi, 11:30913
Nakatani, T., *See* Koshiba, Y., 11:29812
Nanstad, R.K., *See* Bryan, R.H., 11:29796
Napier, B.A., *See* McKenzie, D.H., 11:29446
Narayan, R., Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)
Narayanan, A., *See* Loo, R.Y., 11:29522
Nariai, Hidekazu, On a quantized scalar field in the combined de Sitter-Nariai universe, 11:30805 (R;JP)
Narjes, L., Problems of large-volume gas flow measurements in the high and low pressure range. Proceedings, 11:29253 (R;DE;In German)
Nauenberg, U., *See* Hodges, C., 11:30452
See Young, C.C., 11:30476
Naughton, M., *See* Kornblith, L. Jr., 11:29365
See Leventhal, L., 11:29354
Naughton, M.D., *See* Jacob, N.P., 11:29392
See McGrath, R.N., 11:29347
See Neal, T.P., 11:29387
Nave, S.E., Magnetic susceptibility of CfN, CfAs, and CfSb, 11:30190 (R;US)
Naydowski, C.O., *See* Fuchs, F.W., 11:30063
See Skudelny, H.C., 11:30062
Nazer, M., UPM solar cooling project, 11:29577 (RA;US)
Neal, T.P., Operational experience of the Palisades volume reduction system: the first 12 months, 11:29387 (RA;US)
Neal, T.R., Simple blast model for structural design, 11:30513 (R;US)

Nedeljkovic, J.M., Enhanced photoredox chemistry in quantized semiconductor colloids, 11:30289 (J;US)
Neef, W.S., *See* Moir, R.W., 11:31103, 11:31143
Neff, K.H., *See* Goodman, M.M., 11:30661
Negin, C.A., Estimating waste disposal quantities from raw waste samples, 11:29395 (RA;US)
Negley, G.H., *See* McNeely, J.B., 11:29523
Nellson, R.M., *See* Hensiee, S.P., 11:31240
Nelson, C.A. Jr., *See* Drake, G., 11:30447
Nelson, D.J., Estimates of periphyton mass and stream bottom area using phosphorous-32, 11:30607 (J;GB)
See Elwood, J.W., 11:30606
Nelson, G.W., *See* Kondepudi, D.K., 11:30632
Nelson, J.L., Preliminary Hanford Waste Vitrification Plant waste form qualification plan, 11:29416 (R;US)
Nelson, T.T., Heber binary project, 11:29627 (RA;US)
Nelson, W.D., Overview of the Fusion Power Demonstration study, 11:31129 (J;US)
Nenadovic, M.T., *See* Nedeljkovic, J.M., 11:30289
Neri, J.M., *See* Boller, J.R., 11:31265
Nesbitt, F.L., *See* Smalley, J.F., 11:30287
Neta, P., Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)
See Huie, R.E., 11:30204
See Meot-Ner , M., 11:30258
Neuer, G., *See* McElroy, D.L., 11:30021
Neulinger, F., *See* Rullman, D.H., 11:29742
Neuman, D., *See* Fischer, R., 11:30165
Neviere, G., *See* Mourgues, A., 11:29794
Nevitt, M.V., Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Newman, B.E., Evolution of free-electron laser development, 11:30362 (R;US)
See Scott, M.L., 11:30341
Newnam, B.E., *See* Goldstein, J.C., 11:30363
Newton, J.O., *See* Leigh, J.R., 11:30914
Nexsen, W.E., *See* Turner, W.C., 11:31259
Neymotin, L.Y., Analysis of high pressure boil-off situation during MSIV closure ATWS in a typical BWR/4, 11:29826 (R;US)
Ngoepe, P.E., *See* Allen, A.M.T., 11:30158
Nicklin, D.J., *See* Chong, Y., 11:29270
Nielson, D.L., Geological and geochemical techniques for fracture definition in geothermal reservoirs, 11:29640 (RA;US)
Niemeyer, J.W., Pulsing on a cold-side precipitator: Florida Power Corporation, Crystal River, Unit 1, 11:29710 (RA;US)
Nieuwland, H.C.D., Comparison of the tensile properties of 9-12% Cr. steels. (Pt. 1) data files, (Pt. 2) final report, 11:30094 (R;FR)
Nifenecker, H., *See* Ashgar, M., 11:30924
Nikitopoulos, D.E., Single-substance, two-phase duct flow: a unified theoretical and experimental study, 11:30377 (R;US)
Nilson, R.N., *See* Shaffer, R.J., 11:29252
Nilsson, J., Stockholm project. Quality control of energy-efficient settlement, 11:29992 (R;SE;In Swedish)
Nishihara, Yukoi, Stabilizing solidification II: fundamental test of the waste solidification process utilizing hydrothermal reaction, 11:29346 (RA;US)
Nishimoto, D.D., Options for treatment, storage, and/or disposal of radioactive mixed waste at the Idaho National Engineering Laboratory, 11:29334 (RA;US)
Niu, Keishiro, *See* Arai, Masaru, 11:31071
See Kawata, Shigeo, 11:31072
See Nagata, Norimasa, 11:31073
Niyimbona, P., Potential and development of biogas technology in Burundi: Options and constraints, 11:29465 (RA;DE;In French)
Nobre, J.S.M., Use of arsenazo-III for the determination of uranium in phosphate materials. Study of interfering elements, 11:30180 (RA;BR;In Portuguese)
Noel, P., *See* Fieux, B., 11:30397
Noguera, S., *See* Oteo, J.A., 11:30865
Nohso, S., *See* Masuda, S., 11:29721
Noordik, J., *See* Rajan, O.A., 11:30280
Norbaeck, K., Pilot study in producing briquettes from peat, 11:29212 (R;SE;In Swedish)
Norris, B.L., *See* Propst, R.M., 11:29367
Norris, J.R., *See* Kispert, L.D., 11:30272
Norris, R.K., *See* Meot-Ner , M., 11:30258
Northey, L.M., *See* Reilly, J.K., 11:29832
Notz, K.J., *See* Forsberg, C.W., 11:29421
Noufi, R., *See* Abou-Elfotouh, F., 11:29552
Novak, S.S., *See* Strojan, C.L., 11:30569, 11:30570, 11:30760
Novakov, T., *See* Dod, R.L., 11:30537
Nowak, D., Test and data reduction algorithm for the evaluation of lead-acid battery packs, 11:30052 (RA;US)
Nowlan, M.J., *See* Spitzen, M.B., 11:29551
Noyes, R.M., *See* Kaushik, S.M., 11:30262
Nozik, A.J., *See* Nedeljkovic, J.M., 11:30289
Nuckolls, J.H., Economic potential of inertial fusion, 11:31258 (J;US)
Nudelfuden, A., *See* Benjamin, R., 11:31016
Numan, M.Y., Computer model for evaluation of form factors and interreflected radiant exchange for irregular geometrics with partial obstruction, 11:29499 (RA;US)
Finite difference algorithm for the evaluation of the response factors of multilayer slabs for dynamic simulation of transient conduction heat flow, 11:30008 (RA;US)
Nuttall, A., *See* Ashford, V., 11:30449
Nuttall, H.E., *See* Du, C., 11:29940
Nygren, D., *See* Huth, J., 11:30488
Nygren, I., Manufacturing of blades WTS 1200, 11:29666 (R;SE;In Swedish)
Nygren, R.E., U.S. Blanket Technology Programs, 11:31132 (J;US)
See Misra, B., 11:31146
Nyhan, J.W., Distribution of plutonium and americium beneath a 33-year-old liquid waste disposal site, 11:30618 (J;US)
Technology development for the design of waste repositories at arid sites: field studies of biointrusion and capillary barriers, 11:29404 (R;US)
Nylander, J., Carbon particulate reduction evaluation for oil-fired utility boilers, 11:29684 (RA;US)
Nylund, P.O., *See* Aronsson, R., 11:29991

O

O'Brien, F.D., *See* Durham, C.O. Jr., 11:29638
O'Brien, S.C., *See* Zhang, Q.L., 11:30248
O'Connor, M.T., Optoacoustic detection of photodissociation and thermomolecular recombination in Cl_2, 11:30294 (J;US)
O'Connor, P., *See* Sheppard, M.T., 11:29430
O'Connor, T., *See* Williams, M.D., 11:31198
O'Dell, R.D., Radiation transport. Progress report, April 1, 1985-June 30, 1985, 11:29795 (R;US)
O'Hagan, J. B., *See* Bacon, F. M., 11:30668
O'Leary, G.P. Jr., *See* Sunderman, F.W. Jr., 11:30729
O'Leary, M.H., *See* Deleens, E., 11:30677
O'Neill, R.V., *See* Barnthouse, L.W., 11:30601
O'Toole, J.A., Evolution of the Fusion Power Demonstration tandem mirror reactor configuration, 11:31128 (J;US)
See Nelson, W.D., 11:31129
Oblow, E.M., *See* Pin, F.G., 11:30741
Oden, N.L., Assessing the significance of a spatial correlogram, 11:31292 (J;US)
Odom, M.K., Revision of Primary Standards Laboratory's methods to calculate water vapor preasures, 11:31286 (R;US)
Oechel, W.C., Potential responses of tundra ecosystems to perturbations from energy development. Part I. Annual report, 1983, 11:30591 (R;US)
Oestergren, A., Accumulators for the system of power plants delivering heat and electricity, 11:29877 (R;SE;In Swedish)
Oestman, H., *See* Jungerstam, B., 11:30026
Ogis, E.N.A., Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)
Oh, I., Radiological analysis for dry cask storage of spent fuels, 11:29443 (RA;US)
Ohshima, T., *See* Yasuda, T., 11:30833
Ohuka, T.K., *See* Drake, G., 11:30447
Okada, K., *See* Mochizuki, T., 11:30374
Okazaki, S., *See* Nakamura, O., 11:29673
Okkonen, J., *See* Laine, R., 11:29491
Olander, D.R., *See* Balooch, M., 11:30161, 11:30199
Oliva, J.M., *See* Jacobs, H.R., 11:29269
Olivari, D., Application of the methods of statistical analysis of pseudo-random signals to the interpretation of fields trials on the atmospheric transport of active products and to estimate of confidence limits, 11:30536 (R;FR)
Oliver, B.M., *See* Brumbach, S.B., 11:29777

Oliver, J., Results from the Non-Residential Buildings Energy Consumption Survey (NBECS), 11:29966 (RA;US)
Ollila, H., Improvement of the energy economy of industrial lightning, 11:30025 (R;FI;In Finnish)
Ollinger, O., *See* Radmer, R., 11:29502
Olsen, C.R., *See* Linsalata, P., 11:30619
Olsen, J.N., *See* Sweeney, M.A., 11:31220
Olsen, K.B., Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system, 11:30224 (J;GB)
Olson, M.C., Application of organic tracers in characterizing the Greater Confinement Disposal Test at the Nevada Test Site, 11:29340 (RA;US)
Olson, R.E., *See* Watrous, J.J., 11:30982
Olson, R.J., Application of a geographic information system in the study of acidic deposition, 11:30609 (R;US)
See Malanchuk, J.L., 11:30578
Olson, R.R., Need to test assumptions of models: the population biology of sessile invertebrates on coral reefs, 11:30602 (RA;US)
Olson, S.R., *See* Kirsten, F.A., 11:30470
Oman, H., *See* Hodgson, R., 11:29892
Ondrias, M.R., *See* Swanson, B.I., 11:30253
Onstott, E.I., Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)
Oppenheim, A.K., The knock syndrome - its cures and its victims, 11:30043 (B;US)
See Parker, T.E., 11:30033
Opperman, E.K., *See* Straalsund, J.L., 11:31246
Orem, S.R., Future particulate regulations: the view of the small manufacturer, 11:30568 (RA;US)
Orera, V.M., *See* Abraham, M.M., 11:30171
Orient, G., *See* Garner, J.K., 11:31152
See Gierszewski, P., 11:31158
Orient, G.E., Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)
Orito, S., Underground searches for anomalous penetrating particles, 11:30835 (RA;JP)
Ortale, C., *See* Patt, B.E., 11:30667
Ortega, J.M., Research in computer science. semiannual report, 11:31283 (R;US)
Ortiz, J.V., *See* Wrobleski, D.A., 11:30319
Osborne, L.S., *See* Johnson, A.S., 11:30477
See Lanza, R.C., 11:30666
Osborne, M.F., Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501, 11:29855 (R;US)
See Lorenz, R.A., 11:29748
Oscarson, D.W., *See* Saluja, P.P.S., 11:29312
Osterhoudt, T.R., *See* Reilly, J.K., 11:29832
Ostrow, S.L., Intact decommissioning of nuclear power plants: a dose assessment, 11:29747 (R;US)
Oteo, J.A., Non-leptonic hyperon decays in the chiral bag model, 11:30865 (R;FR)
Otsuka, N., *See* Fischer, R., 11:30165
Ottesen, J., *See* Milde, H., 11:29706
Ottinger, P.F., Theoretical modeling of the plasma opening switch, 11:31020 (BA;US)
See Boller, J.R., 11:31265
Ouellette, P.A., *See* Kurylo, M.J., 11:30207
Outlaw, W.H. Jr., Guard cell biochemistry: response to environmental stimuli causing changes in gas exchange, 11:29501 (R;US)
Histochemical technique: a general method for quantitative enzyme assays of single cell extracts with a time resolution of seconds and a reading precision of femtomoles, 11:30634 (J;US)
Overton, W.C. Jr., *See* Barclay, J.A., 11:30360
Owen, E.W., Multivariable current control for electrically and magnetically coupled superconducting magnets, 11:31187 (J;US)
Owens, T.L., Folded waveguide cavity coupler for ICRF heating, 11:31027 (R;US)
Radio frequency vacuum feedthroughs for high-power ICRF heating applications, 11:31192 (J;US)
See Baity, F.W., 11:31026
See Hoffman, D.J., 11:31028, 11:31193
See Whealton, J.H., 11:31199
Oyama, Y., Operating and geometrical arrangement requirements for fusion neutronics testing, 11:31243 (J;US)
Oztunali, O.I., *See* Chan, D.W., 11:29364
Oztunali, O.O., *See* Ostrow, S.L., 11:29747

P

Packan, N.H., Radiation-induced segregation in light-ion bombarded Ni-8% Si, 11:30088 (R;US)
Packer, L., *See* Sonnewald, U., 11:30637
Paffenhoefer, G.A., *See* Gardner, W.S., 11:30657
Paffrath, L., *See* Bernstein, D., 11:30445
Page, D.I., Generic wind studies in the DEn programme, 11:29647 (RA;GB)
See Davies, P.G., 11:29643
Pahl, T.R., *See* Toste, A.P., 11:29422
Paintin, J.K., Seismic surveys at Blackburn, Buller coal fields, New Zealand, 11:29202 (R;NZ)
Pakrasi, H.B., Membrane development in the cyanobacterium, Anacystis nidulans, during recovery from iron starvation, 11:30671 (J;US)
Palacio, M., *See* Boncoeur, M., 11:30120
Palmer, B.A., Wavelengths and energy levels of doubly ionized uranium (U III) obtained using a Fourier-transform spectrometer, 11:30321 (J;US)
Palmer, J.A., *See* Chan, D.W., 11:29364
Palmer, J.V., *See* Chan, D.W., 11:29364
Palmquist, R.D., Kinematic modelling and graphic simulation of path planning for mobile vehicles, 11:30351 (R;US)
Pantos, E., *See* Paull, M.K., 11:29226
Panvini, R., *See* Young, C.C., 11:30476
Panvini, R.S., *See* Hodges, C., 11:30452
Papike, J.J., Thermally induced chemical migration: a natural analog approach. [Technical progress report], 11:30759 (R;US)
Park, D.L., *See* Prentice, E.F., 11:30685
Park, H., Tokamak plasma density fluctuation studies using a multichannel scattering apparatus, 11:31015 (BA;US)
Park, J.F., Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences, 11:30696 (R;US)
Park, J.Y., Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments, 11:29754 (J;US)
Park, S.H., Thermal analysis of UF_6 cylinder inside a protective overpack, 11:30385 (R;US)
Park, S.Y., An experimental study of a quasi-optical gyrotron for fusion applications, 11:31269 (BA;US)
Park, Y.M., Assessment of the use of half-square cans on the management of spent fuel, 11:29301 (R;US)
Parker, H., National Fertilizer Development Center progress 84, 11:30686 (R;US)
Parker, T.E., Induction period for ignition of fuel sprays at high temperatures and pressures, 11:30033 (R;US)
Parrish, B.R., *See* Chan, D.W., 11:29364
Parsly, L., *See* Sheffield, J., 11:31085
Partain, L.D., Vacuum MOCVD fabrication of high efficience cells, 11:29524 (RA;US)
Partridge, M.J., 1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
Pasko, W., *See* Matthews, C., 11:29333
Passarella, R., *See* Upschulte, B.L., 11:30212
Pasternak, A.D., California's response to the Low-Level Radioactive Waste Policy Act of 1980: policy and progress, 11:29321 (RA;US)
Pastuszek, L.M., Directions in commercial sector electricity forecasting, 11:29972 (RA;US)
Patel, J.J., Some thoughts on the Community Biogas Plants, 11:29473 (RA;DE)
Paterson, C.N., *See* Apsimon, R.J., 11:30450
Pati, J.C., *See* Huebsch, T., 11:30861
Patnaik, P.C., High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
Patrick, W.C., *See* Butkovich, T.R., 11:30756
Patt, B.E., Mercuric iodide X-ray camera, 11:30667 (J;US)
Patterson, R.E., Design, performance investigation and delivery of a miniaturized Cassegrainian concentrator solar array. Final technical report, 11:29515 (R;US)
Patterson, R.G., *See* Duncan, M.W., 11:30529
Pattoret, A., *See* Philippot, J., 11:29806
Paul, D., *See* Atencio, L.G., 11:30480
Paull, M.K., Annual outlook for US coal 1986, with projections to 1995, 11:29226 (R;US)
Pavelek, M.D. II, Volume reduction of contaminated concrete shield slabs

through surface removal, 11:29360 (RA;US)
Pavelka, E. A., Metal-to-ceramic attachment device, 11:30110 (P;US)
Pawel, R.E., Accuracy of the linear gradient approximation for diffusion-controlled growth of iron sulfide, 11:30142 (J;US)
Pawlek, P., *See* Breunlich, W.H., 11:31077
Payet, J., Study of some direct reactions at 0° in $^{18}O+^{26}Mg$ and $^{18}O+^{12}C$ systems, 11:30897 (R;FR;In French)
Pearman, B.L., *See* Coutant, C.C., 11:30702
Pearson, K.G., *See* Cooper, C.A., 11:29839
Pechan, E., *See* Graves, K., 11:30551
Peden, C.H.F., Kinetics of CO oxidation over Ru(0001), 11:30201 (J;US)
Peebles, W.A., *See* Park, H., 11:31015
Pefley, R.K., Research and development of alcohol fuel useage in spark-ignited engines, 11:30069 (R;US)
Pegg, D.J., Production and destruction of metastable negative ions. Progress report, September 1, 1985-August 31, 1986, 11:30813 (R;US)
Pehl, R.H., High-purity germanium charged-particle detectors: A LBL-IUCF update, 11:30481 (J;NL)
Pellegrini, A., *See* Cagnetti, P., 11:30558
Peloquin, R.A., *See* Hawley, K.A., 11:29450
See McKenzie, D.H., 11:29446
Pelto, P.J., *See* Mullen, M.F., 11:29753
Pendergrass, J.H., Compact inertial confinement fusion multireactor concepts, 11:31224 (J;US)
See Cronwell, J.B., 11:31228
See Harris, D.B., 11:31227, 11:31230
Pendergrass, J.M., *See* Harris, D.B., 11:31229
Peng, Y.-K.M., *See* Galambos, J.D., 11:31235
See Strickler, D.J., 11:31186
Peng, Y.K.M., *See* Galambos, J.D., 11:31029
Penix, W., *See* Kasten, D.G., 11:30394, 11:30395
Penner, J.E., Progress in developing the smoke source term for "nuclear winter" studies: major uncertainties, 11:30545 (R;US)
Penz, A., Improving energy performance in office buildings: institutional behavior, 11:29977 (RA;US)
Pepper, D.W., Modeling of convective mixing downstream of separately heated annuli, 11:30378 (R;US)
Transport of nitrate from a large cement based waste form, 11:29436 (R;US)
Perez-Mendez, V., Detection of charged particles in amorphous silicon layers, 11:30425 (R;US)
See Fujieda, I., 11:30461
See Kaplan, S.N., 11:30428
Perkins, B.A., Subsurface moisture regimes and tracer movement under two types of trench-cap designs for shallow land burial sites, 11:29403 (R;US)
Perkins, D.E., *See* Stewart, M.E., 11:30984
Perkins, L.J., Plasma engineering for MINIMARS: a small commercial tandem mirror reactor with octopole plugs, 11:31168 (J;US)
See Campbell, R.B., 11:30997
See Gorker, G.E., 11:31115
See Nelson, W.D., 11:31129
Perkins, M., *See* Calo, J.M., 11:29160
Perkins, S.T., *See* Wong, C., 11:31154
Perl, M., *See* Innes, W., 11:30499
Pernpeintner, R., Aerodynamic theory in the calculation of the GROWIAN rotor compared with some experimental data, 11:29659 (RA;DE)
Perrot, J., *See* Brossard, J., 11:29798
Perry, H.A., Oil shale grade variability in close-spaced core holes in the Mahogany zone of the Colony Shale Oil Project area, 11:29257 (BA;US)
See Day, M.J., 11:29256
Persinko, D., Investigation of the contributors to wrong unit or wrong train events, 11:29849 (R;US)
Pesaran, A.A., Silica gel sorption properties under adiabatic conditions, 11:29604 (R;US)
See Maclaine-cross, I.L., 11:29603
Pesme, O., *See* Philippot, J., 11:29806
Peters, R.R., *See* Klavetter, E.A., 11:30742
Petersen, R.C., *See* Yonker, C.R., 11:30182
Peterson, B.E., *See* Joy, D.S., 11:29308
Peterson, D.G., *See* Carr, R.W. Jr., 11:30286
Peterson, J.R., *See* Nave, S.E., 11:30190
See Young, J.P., 11:29426
Peterson, K.R., *See* Shapiro, C.S., 11:30697
Peterson, M.E., Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)
Peterson, N.L., Diffusion and point defects in Cu_2O, 11:30139 (J;GB)
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)
Silver-tracer diffusion in Cu_2O, 11:30230 (J;GB)
See Hoshino, K., 11:30232
Peterson, S.R., Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Peterson, T.W., Aerosol formation from pulverized coal combustion. Final technical report, 11:29186 (R;US)
Petersson, E., *See* Joensson, B., 11:29213
Petkov, I.Zh., Construction of local-scale transformed wave functions and its application to ATDHF, 11:30932 (R;XA)
Petrequin, P., *See* Gauthier, J.P., 11:30074
Petrequin, P., *See* Nieuwland, H.C.D., 11:30094
Petridou, C.I., *See* Woody, C.L., 11:30451
Petrie, T., *See* Kahn, C., 11:30989
Pettit, T.L., *See* Fox, M.A., 11:30265
Pettus, W.G., TMI-2 defueling canister reactivity calculations, 11:29760 (RA;US)
Petty, J.L., Hazardous Waste Remedial Actions Program: integrating waste management, 11:29445 (R;US)
Pezzullo, J.A., *See* Suffridge, F.E., 11:29233
Phatak, R.G., Air blast type coal slurry fuel injector, 11:29224 (P;US)
Phelps, P.L., *See* Kaifer, R.C., 11:30432
Philbin, J.S., *See* El-Genk, M.S., 11:29863, 11:29864
Philippot, J., High temperature mass spectrometry study on fast-neutrons-nuclear-reactor irradiated fuel, 11:29806 (R;FR)
Phillips, B.J., *See* Fife, K.W., 11:29294
Phillips, J., *See* Hong, R., 11:31207
Phillips, J.E., *See* Birkmire, R.W., 11:29550
Phillips, K.J.H., *See* Emslie, A.G., 11:30788
See Harrison, R.A., 11:30789
Phillips, M.W., *See* Todd, A.M.M., 11:30964
Phillips, R.D., *See* Anderson, L.E., 11:30732
Phillips, W.R., *See* Leigh, J.R., 11:30914
Piciulo, P.L., Release of organic reagents from solidified decontamination wastes, 11:29433 (RA;US)
Pickett, H.M., *See* Waters, J.W., 11:30181
Pickles, W.L., *See* Turner, W.C., 11:31259
Picologlou, B.F., *See* Reed, C.B., 11:31110
Picologlou, B.F., Magnetohydrodynamic considerations for the design of self-cooled liquid-metal fusion reactor blankets, 11:31111 (J;US)
See Cha, Y.S., 11:31105
See Walker, J.S., 11:31112
Piednoir, P., *See* Bourgault, F., 11:30075
Pierce, J.D., *See* Allen, G.C., 11:30348
See Gonzales, A., 11:30349
Pierias, R., *See* Iji, Teruo, 11:29352
Piet, S., *See* Tilack, M., 11:31245
Piet, S.J., Safety evaluation of the Blanket Comparison and Selection Study, 11:31107 (J;US)
See Sze, D.K., 11:31096
Piggott, B.D.G., *See* Fairbairn, S.A., 11:29840, 11:29841
Pignol, L., Theoretical and experimental study of modes associated to ion cyclotron heating on TFR, 11:30967 (R;FR;In French)
Pigoury, M., *See* Alamo, A., 11:30072, 11:30076
Pin, F.G., Automated sensitivity analysis using the GRESS language, 11:30741 (R;US)
See Worley, B.A., 11:29398
Pinchera, G.C., Assessing environmental effects of oil-fuelled energy systems, 11:30527 (R;IT)
Pines, A., *See* Thayer, A.M., 11:30239
See Zax, D.B., 11:30203
Piraino, M., Photovoltaic-electrolyzer system performance results, 11:29458 (BA;CA)
Pitkaenen, J., *See* Laurikko, J., 11:30038, 11:30041, 11:30042
Pitts, J. R., Method of bonding silver to glass and mirrors produced according to this method, 11:29610 (P;US)
Pitts, J.H., Development of the cascade inertial-confinement-fusion reactor, 11:31226 (J;US)
Flow characteristics of the Cascade granular blanket, 11:31159 (J;US)
Pitx, W.J., *See* Westbrook, C.K., 11:29488
Pitzer, K.S., Large-scale fluctuations and the critical behavior of dilute NaCl in H_2O, 11:30197 (J;US)
Piulle, W., *See* Belba, V., 11:29689
See Landham, E.C. Jr., 11:29714
See Monahu, G., 11:29740
Piulle, W.R., *See* DuBard, J.L., 11:29715
Piux, F., *See* Beuttenmuller, R., 11:30423
Pivec, A., Application testing of batteries for utility load leveling and customer applications at the Battery Energy

Storage Test (BEST) Facility, 11:29671 (RA;US)
Place, B.G., Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort, 11:29281 (BA;US)
Plante, G., Corrosion studies on HLW steel containers, 11:29316 (R;FR)
Plechaty, E.F., *See* Wong, C., 11:31154
Poeppel, R.B., *See* Misra, B., 11:31146
Poff, K.L., *See* Steinitz, B., 11:30683
Pohl, B.A., *See* Wong, C., 11:31154
Polkela, E., *See* Aalto, A., 11:29675
Poletti, A.R., Short lived isomers in ^{211}Rn and ^{210}Rn, 11:30920 (R;AU)
See Byrne, A.P., 11:30922
See Gerl, J., 11:30916
See Poletti, S.J., 11:30921
Poletti, S.J., G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
See Byrne, A.P., 11:30922
See Gerl, J., 11:30916
See Poletti, A.R., 11:30920
Pollock, M.D., Universe created from 'nothing' as a broken symmetry theory of gravity, 11:30769 (R;XA)
Poncin, A., *See* Haines, J.E., 11:29510
Pongratz, M., *See* Lebeda, C., 11:30808
Pontius, D.H., Experimental studies of space charge effects in an ESP, 11:29724 (RA;US)
See Bush, D.V., 11:29716
Ponton, W., *See* Goldfurb, S., 11:31209
Pool, K.H., *See* Robertus, R.J., 11:29628
Pooler, A.R., *See* Thimsen, D., 11:29238
Poor, N.D., Comparison of low-level radioactive waste management alternatives, 11:29335 (RA;US)
Poppe, C.H., *See* Brady, F.P., 11:30941
Porle, K., Full scale experience with pulsed energization of electrostatic precipitators, 11:29708 (RA;US)
Porta, J., *See* Mourgues, A., 11:29794
Porter, W.E., *See* Brooks, J.M., 11:30737
Posey, J.C., Use of high-pressure ion exchange for the production of gadolinium-153. Status report, 11:30314 (R;US)
Post, D.E., Poloidal divertor systems for impurity and particle control in ignition Tokamaks, 11:31138 (J;US)
Post, R.G., Waste Management '85: Waste Isolation in the US - Technical Programs and Public Education. Volume 2. Waste policies and programs, low-level waste, 11:29317 (R;US)
Potok, R.E., *See* Le Claire, R.J., 11:31165
Pouey, M., S3T working group. Report 1: group aims, 11:30976 (R;FR;In French)
Poulsen, P., *See* Molvik, A.W., 11:30985
Powell, J.R., High flux research reactors based on particulate fuel, 11:29784 (R;US)
High power density reactors based on direct cooled particle beds, 11:29783 (R;US)
See Botts, T.E., 11:30404
See Horn, F.L., 11:29824
Powers, E.J., *See* Levinson, S.J., 11:31018
Powers, T.B., *See* Mullen, M.F., 11:29753
Praeg, W.F., Simulating the effects of plasma disruption with A 1 MA current pulse in a coaxial test fixture, 11:31006 (J;US)
Praey, W.F., *See* Turner, L.R., 11:31164
Prather, W.S., *See* Van Hare, D.R., 11:30496
Pratt, S.T., Predissociation and ionization of excited KrXe observed using resonantly enhanced multiphoton ionization-photoelectron spectroscopy, 11:30293 (J;NL)
Prechter, R.E., *See* Williams, M.D., 11:31198
Preece, D.S., Three dimensional modeling of the wedge pillar portion of the WIPP Geomechanical Evaluation (Room G) in situ experiment, 11:30755 (R;US)
Prentice, E.F., Study to determine the biological feasibility of a new fish tagging system. Annual report 1984, 11:30685 (R;US)
Prescott, C.Y., *See* Hodges, C., 11:30452
Preston, G.T., Impact of coming particulate control requirements on the utility industry, 11:30565 (RA;US)
Preston, R.J., Use of cytogenetic endpoints in human lymphocytes as indicators of exposure to genotoxicants, 11:30721 (BA;US)
Prestwich, S.M., Overview on Cascades drilling status, 11:29619 (RA;US)
Prevo, C.T., *See* Kaifer, R.C., 11:30432
Prewett, P.D., Liquid metal field emission thrusters and ion sources: a review. Final report, 11:30032 (R;GB)
Price, J.C., *See* Innes, W., 11:30499
Price, K.R., *See* Rickard, W.H., 11:30585
Prichard, B.A., *See* Williams, M.D., 11:31198
Prince, M.B., Cell efficiency and module cost goals to achieve economic photovoltaic central power systems in the United States, 11:29563 (BA;US)
Probstein, R.F., Polydisperse coal slurry rheology. Quarterly report, 11:29179 (R;US)
Prohammer, L.A., Field sampling design and method of statistical analysis to define the areal extent of PCB contamination in low-level waste pond sediments, 11:29432 (RA;US)
See McKenzie, D.H., 11:29446
Propst, R.M., Liquid radwaste minimization efforts at Duke Power Company, 11:29367 (RA;US)
Prouillac, C., *See* Labat, P., 11:29768
Pruess, K., *See* Doughty, C., 11:29405
See Wu, Y.S., 11:29235
Pugh, R.J., *See* Straalsund, J.L., 11:31246
Pui, D., *See* Thimsen, D., 11:29238
Pulgh, R.J., *See* Garner, F.A., 11:31054
Purcupile, J.C., Pressure loss in packed beds of low void fraction, 11:29267 (BA;US)
See Rye, P.B., 11:29266
Purtyman, W.D., *See* Nyhan, J.W., 11:30618
Pyle, R.V., *See* Stearns, J.W., 11:31219
Pyun, R., *See* Robinson, R.A., 11:30486
Pyzik, A.J., *See* Halverson, D.C., 11:30132

Q

Qian Zeshu, Anaerobic digestion of slaughter waste water, 11:29469 (RA;DE)
Quartacy, G., *See* Taback, H., 11:29280
Quay, P.D., *See* Hedges, J.I., 11:30605
Quigley, R.M., Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
Quimby, D.C., *See* Crawford, E.A., 11:30371
Quinby, T. C., Method for production of ceramic oxide and carbide bodies by polymer inclusion and decomposition, 11:30419 (P;US)
Quinet, J.L., *See* Fontaine, J.P., 11:29780
Quinn, G.J., TMI-2 spent fuel shipping, 11:29297 (RA;US)

R

Raabe, O.G., *See* Allen, M.D., 11:30821
Rabani, J., *See* Neta, P., 11:30252
Rabideau, P.W., Conformational analysis of 1,4-cyclohexadienes. A shallow boat-shaped 1,4-dihydronaphthalene, 11:30261 (J;US)
Radeka, V., *See* Fischer, J., 11:30422, 11:30459
Radford, L.R., *See* Wood, M.T., 11:31272
Radhakrishna, H.S., Thermal properties of clay-based buffer materials for a nuclear fuel waste disposal vault, 11:30147 (R;CA)
Radhwan, A., *See* Gari, H., 11:29567
Radimer, B.M., *See* Pivec, A., 11:29671
Radmer, R., Depletion of photosystem 2 extrinsic proteins. I. Effects of O_2 and N_2 flash yields and steady state O_2 evolution, 11:29502 (R;US)
Ragan, G.E., *See* Swaja, R.E., 11:30493
Rager, R.E., *See* Brinkman, J.E., 11:29325
Ragland, W.A., *See* Mueller, C.J., 11:29860
Rafaud, J., *See* de Buzonniere, A., 11:29343
Rafilo, J., *See* Tuunanen, P., 11:29999
Raimondo, E., Taking qualification requirements into account at the different levels of engineering. Nuclear qualification of electrical equipments, 11:29799 (R;FR;In French)
Rajan, O.A., Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
Ramachandran, S., *See* Park, Y.M., 11:29301
Rambeck, W.A., *See* Meiringer, G., 11:30718
Ramey-Smith, A., *See* Persinko, D., 11:29849
Ramsey, G.H., *See* Sparks, L.E., 11:29733
Ramsthaler, J., *See* Coffer, H., 11:29914
Ranck, C.I., *See* Johnsen, R.C., 11:29493
Rand, D.A.J., Overview of Australian lead/acid battery test programs, 11:29879 (RA;US)
Randrup, J., *See* Koonin, S.E., 11:30937
Rankin, W.L., *See* Triggs, T.J., 11:29792
Rao, B.B., *See* Anderson, W.A., 11:29531
See Banerjee, S., 11:29530
Rao, K.R., Measures for energy conservation in buildings: Singapore experience, 11:30011 (RA;US)
Rao, P.K.M., *See* Carter, T.J., 11:29372
Rao, V.S., *See* Skinner, G.B., 11:30322

Rapaport, J., *See* Taddeucci, T.N., 11:30487

Raridon, R.J., *See* Whealton, J.H., 11:31010, 11:31199

Rasmussen, D.A., Measurements of high frequency fluctuations in EBT, 11:31022 (BA;US)

Rasmussen, F., Aerodynamic performance of a new LM 17.2 m rotor, 11:29660 (RA;DE)

Rasmussen, G.A., Recycle operations as a methodology for radioactive waste volume reduction, 11:29344 (RA;US)

Rasmussen, J., *See* Rosbury, K.D., 11:29201

Rasneur, B., Tritium breeding material : α $LiAlO_2$, 11:31160 (J;US)

Ratcliff, B., *See* Ashford, V., 11:30449

Ratel, R., *See* Barbry, F., 11:29816

Rathmann, O., *See* Kaiser, N.E., 11:30379

Rauch, W., *See* Efthimion, P., 11:31004

Rauchfuss, T.B., *See* Wrobleski, D.A., 11:30319

Ravishankara, A.R., Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985, 11:30234 (R;US)

Rawls, J.M., *See* Hoffman, D.J., 11:31028

Raymond, J.R., *See* Molz, F.J., 11:29878

Raymond, K. N., *See* Weit, F. L., 11:29242

Raynor, G.S., Wind direction meander at a coastal site during onshore flows, 11:30521 (J;US)

Re, E., Giotto power supply subsystem, 11:29509 (RA;FR)

Read, M.E., *See* Fliflet, A.W., 11:31270
See Park, S.Y., 11:31269

Reames, D.V., *See* Mason, G.M., 11:30786

Redding, M.J., Framework for resolving hazardous waste cleanup liability, 11:30593 (RA;US)

Reece, M., *See* Westrich, H.R., 11:29639

Reed, C.B., Experimental facility for studying MHD effects in liquid metal cooled blankets, 11:31110 (J;US)

Reed, G.D., *See* Davis, W.T., 11:29731

Reed, J.B. Jr., *See* Blackburn, T.W. III, 11:29319

Reese, R.T., *See* Bateman, V.I., 11:30345

Reeves, M., Long-term endurance and selection studies in hydrogen and oxygen photoproduction by Chlamydomonas reinhardtii, 11:29457 (J;GB)

Rehn, L.E., *See* Erck, R.A., 11:30083

Reich, M., *See* Subudhi, M., 11:29850

Reichart, G., *See* Hauptmanns, U., 11:30390

Reichel, L.W., Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)

Reid, M.C., *See* Sunderman, F.W. Jr., 11:30729

Reid, R.L., Tandem Mirror Reactor Systems Code (TMRSC), 11:31117 (J;US)

Reiersen, W.T., *See* Sheffield, J., 11:31085

Reif, R., *See* Ashford, V., 11:30449
See Bird, F., 11:30478

Reiff, J.E., *See* Cable, M.D., 11:30907

Reihl, B., *See* Frank, K.H., 11:30111

Relland, P., Preliminary radon testing results for the Residential Standards Demonstration Program. Program results No. 3, 11:29905 (R;US)

Reilly, H.J., Issues relating to the siting of tritium-fueled fusion experiments, 11:31214 (J;US)

Reilly, J.K., Institutional agreements and interaction for research and disposition of nuclear waste from Three Mile Island, 11:29831 (RA;US)
Processing and removal of the Three Mile Island makeup and purification system resins, 11:29832 (RA;US)

Reimann, R. C., Director fired absorption machine flue gas recuperator, 11:30030 (P;US)

Reimers, J.R., Exact eigenfunctions and eigenvalues of a two-dimensional rigid rotor obtained using Gaussian wave packet dynamics, 11:30816 (J;US)
Exact thermal rotational spectrum of a two-dimensional rigid rotor obtained using Gaussian wave packet dynamics, 11:30817 (J;US)

Reisenauer, A.E., *See* Zimmerman, D.A., 11:30604

Reiss, J.F., *See* Ault, G.M., 11:29368

Reiter, E.R., *See* Tang, M., 11:30522

Rej, D.J., Thomson scattering measurements in the FRX-C device, 11:31263 (BA;US)
See Siemon, R.E., 11:31264

Remsen, D.B., *See* Hoffman, D.J., 11:31028

Ren, Z., *See* Steinitz, B., 11:30683

Rengan, K., Stopped-flow technique for transit time measurement in a gas jet, 11:29804 (J;NL)

Renier, J.P., *See* Smith, O.L., 11:29858

Renk, T.J., *See* Boller, J.R., 11:31265

Renner, H., *See* Park, Y.M., 11:29301

Reno, H.W., *See* Schmitt, R.C., 11:29359

Reuse, B., *See* Jezierski, H., 11:29361

Reuter, W.G., *See* Deason, V.A., 11:30383

Reynolds, J., *See* Theodore, L., 11:29745

Reynolds, T.D., Addendum to the distribution of two herptiles in Idaho, 11:30571 (J;US)

Rhoades-Brown, M.J., Heavy ion induced fusion/fission and barrier penetration. Lecture notes, 11:30929 (R;AU)

Rhudy, R.G., Fabric filter operation downstream of a spray dryer: pilot and full-scale results, 11:29729 (RA;US)

Rhyne, W.R., Improvements in release probability by using an overpack, 11:29298 (R;US)

Ricci, R., *See* Hoffman, E.J., 11:30439

Rice, J.E., The source of heavy impurities in the Alcator C Tokamak, 11:31021 (BA;US)
X-ray spectra for 10 keV less than h v less than 100 keV from the Alcator C tokamak, 11:31017 (BA;US)

Rich, R.I., *See* Kaushik, S.M., 11:30262

Richardson, R. W., *See* Berman, S. M., 11:30402

Richey, J.E., *See* Hedges, J.I., 11:30605

Richmond, R., HECTOR measurements on plutonium-uranium metal fuel, 11:29815 (R;GB)

Rickard, W.H., Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington, 11:30585 (J;NL)

Rigby, G.L., *See* Chow, C.K., 11:30119

Riles, K., *See* Barklow, T., 11:30462

Riley, J.D., *See* Mayer-Schwinning, G., 11:29702

Riley, R.G., *See* Prohammer, L.A., 11:29432

Rinard, G., Optimizing the collector sections of multi-stage electrostatic precipitators, 11:29712 (RA;US)
See Durham, M., 11:29711
See Rugg, D.E., 11:29686

Riotte, H.G., *See* Hauptmanns, U., 11:30390

Risser, V.V., *See* Whitaker, C.M., 11:29562

Ristori, C., *See* Ashgar, M., 11:30924

Ritchie, J., Radwaste drying: an engineered system for powdered and granular media, 11:29353 (RA;US)

Ritter, P.D., *See* Caffrey, A.J., 11:30472

Ritter, R.S., *See* Kilpatrick, S.J., 11:30980

Robbins, J.L., *See* Brennan, J.G., 11:30317

Robert, C., *See* Campagnolo, R.E., 11:30659

Roberts, R.A., Radiochemistry of uranium, neptunium and plutonium: an updating, 11:30311 (R;US)

Robertson, L.P., *See* Dubois, R., 11:30455

Robertson, N.A., *See* Chase, S.T., 11:30802

Robertus, R.J., Research on geothermal chemistry and advanced instrumentation, 11:29628 (RA;US)

Robinette, W., *See* Moffa, P., 11:31012

Robinson, A.E., *See* Sonnewald, U., 11:30637

Robinson, C.E., *See* Butler, P.C., 11:29887

Robinson, D., *See* Hall, G., 11:30460

Robinson, G.C., *See* Bryan, R.H., 11:29796

Robinson, R.A., Improved constant-Q spectrometer for pulsed neutron sources, 11:30486 (J;NL)

Robinson, R.L. Jr., Phase behavior of coal fluids: data for correlation development. Report for the period: November 1, 1985-January 31, 1986, 11:29176 (R;US)

Robinson, S.L., A low-cost general purpose spectral display unit using an IBM PC, 11:30438 (J;US)

Robinson, W.L., Accurate measurement of small rotations by modulating polarization. Final report, 11:30500 (R;US)

Roblee, J.W., Vibration damping in externally pressurized gas bearings, 11:30353 (R;US)

Robson, E.I., Blazars, quasars and starbursts, 11:30800 (RA;GB)

Rochester, D.P., Testing and operation of a transportable volume reduction unit, 11:29363 (RA;US)

Rodgers, P.W., *See* Harben, P.E., 11:30354

Rodgers, R.W., *See* Durham, C.O. Jr., 11:29638

Rodrigo Anoro, T., Inclusive production of strange particles in 360 GeV/c PP interactions, 11:30825 (R;ES;In Spanish)

Rodriguez, L.F., *See* Dillmann, C.W., 11:29355

Roed, J., *See* Larsen, G.C., 11:30510

Roemer, J.G.M., *See* Atencio, L.G., 11:30480

Rogers, V.C., *See* Sutherland, A.A., 11:29444

Rogge, M., *See* Atencio, L.G., 11:30480

Rohlfing, C.M., *See* Engelke, R., 11:30515

Romero, L., *See* Ostrow, S.L., 11:29747

Romero, J.A., *See* Anderson, C.A., 11:30162

Romero, J.L., *See* Brady, F.P., 11:30941

Root, R. A., *See* Reimann, R. C., 11:30030

Roper, J. R., Method of measuring metal coating adhesion, 11:30109 (P;US)
Roper, L.D., *See* Arndt, R.A., 11:30851, 11:30852, 11:30853, 11:30854, 11:30855, 11:30856
Ross, E.A., Application of SLIM-MAUD: a test of an interactive computer-based method for organizing expert assessment of human performance and reliability. Volume 1. Main report, 11:29853 (R;US)
Rosar, E.C., *See* Daub, G.J., 11:29258
Rosbury, K.D., Quantification of roadway fugitive dust at a large Midwestern steel mill, 11:30533 (RA;US)
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
Rosen, S.P., Massive neutrinos in particle physics and astrophysics, 11:30872 (R;US)
Rosenberg, E.I., *See* Crawley, H.B., 11:30467
Rosenbluth, M.N., *See* Conn, R.W., 11:31009
Rosenson, L., *See* Johnson, A.S., 11:30477
Rosinger, E.L.J., *See* Dixon, R.S., 11:29309
See Rummery, T.E., 11:29314
Ross, D.S., Improved coal conversion in CO/water systems. Quarterly report No. 5, September 4, 1985-December 3, 1985, 11:29163 (R;US)
Ross, J.N., *See* Milborrow, D.J., 11:29657
Ross, P.N., Hydrogen, 11:30220 (BA;US)
Ross, W.A., *See* Schneider, K.J., 11:29412
Rossen, P. von, *See* Atencio, L.G., 11:30480
Rotelli, P., Monopole annihilations and the knee in cosmic ray data, 11:30829 (RA;JP)
Roth, D.J., Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics, 11:30122 (R;US)
Rothe, K.E., *See* Hamilton, W.R., 11:31116
See Reid, R.L., 11:31117
Rothman, A.B., *See* Mueller, C.J., 11:29860
Roti Roti, J.L., *See* Bodell, W.J., 11:30700
Roudeau, P., Some aspects of the physics at LEP with the Delphi detector, 11:30873 (R;FR)
Roussel, P., *See* Bretonneau, P., 11:30408
Routson, R.C., *See* Delegard, C.H., 11:30616
Rouzaud, P., *See* Magnaud, J.P., 11:30376
Rovesti, W.C., Overview of EPRI residual fuel oil quality criteria project plan, 11:29674 (RA;US)
Rowan-Robinson, M., Cosmological results from IRAS, 11:30804 (RA;GB)
Models for IRAS galaxies, 11:30803 (RA;GB)
Rowcliffe, A.F., US/Japan collaborative testing program in HFIR and ORR: specimen matrices for HFIR irradiation, 11:31050 (RA;US)
Roy, R.F., *See* Hinze, W.J., 11:29622
Roy-Stephan, M., *See* Bachelier, D., 11:30905
Ruby, L., *See* Stearns, J.W., 11:31219
Ruchti, R., A cerium glass fiber-optic active target for high energy physics experiments, 11:30474 (J;US)
See Baumbaugh, A.E., 11:30469
Ruckteschler, R., Development of laser-processed high-efficiency n+pp+ silicon solar cells, 11:29557 (BA;US)
Ruder, R.H., *See* Wong R.F., 11:31104
Rueppel, D.W., *See* Kaifer, R.C., 11:30432
Ruetten, H.J., *See* Teuchert, E., 11:29775
Rugg, D., *See* Durham, M., 11:29711
See Rinard, G., 11:29712
Rugg, D.E., Test results of a precipitator operating at high-temperature and high-pressure conditions, 11:29686 (RA;US)
Rullman, D.H., Optimizing the performance of a modern electrostatic precipitator by design refinements, 11:29742 (RA;US)
Rummery, T.E., Canadian nuclear fuel waste management program, 11:29314 (R;CA)
Rundo, J., *See* Toohey, R.E., 11:30556
Runkle, J., *See* Megusar, J., 11:31064
Rusbridge, G., *See* Jacobson, A., 11:31262
Rusell, D., *See* Dursch, H., 11:29533
Rush, F.E., *See* Doty, G.C., 11:30745
Rush, J.D., Pulse-radiolysis study of ~ mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Russell, K.D., *See* Krantz, E.A., 11:29834
Russell, N.S., Review of NRTMA statistical tests, 11:29451 (R;GB)
Rust, P.R., *See* Emge, T.J., 11:30245
Ruther, W.E., *See* Park, J.Y., 11:29754
Rutledge, A.K., *See* Shephard, L.E., 11:30750
Ruvalds, J., Magnetic impurities in superconductors. Performance report, July 1, 1985-June 30, 1986, 11:30337 (R;US)
Ryan, R.R., *See* Hay, P.J., 11:30316
See Wrobleski, D.A., 11:30319
Rye, P.B., A method for estimating permeability in oil shale retorts based on pressure and temperature measurements, 11:29266 (BA;US)
Rykken, L.E., Analytical characterization of West Valley high-level waste sludge, 11:29396 (RA;US)

S

Saari, L.M., *See* Wood, M.T., 11:31272
Saarnio, A., *See* Kosunen, P., 11:29209
Sachs, I.M., *See* Krial, M.E., 11:29542
Sadler, K., Use of a population model for estimating hazards: interpretation of low pH bioassay results with respect to Norwegian trout populations, 11:30598 (RA;US)
Sadoway, D.R., *See* Kipouros, G.J., 11:30217
Saeed, S.A.R., Influence of orientation on the internal thermal environment of residential buildings in Riyadh, 11:29578 (RA;US)
Sagefka, T., *See* Atencio, L.G., 11:30480
Sagen, J., Energy use in Norway's commercial sector (1965-1983), 11:29950 (RA;US)
Sager, G., Optimal control theory applied to fusion plasma thermal stabilization, 11:31000 (J;US)
Sager, G.T., Plasma instrumentation for fusion power reactor control, 11:31003 (J;US)
Saha, P., *See* Neymotin, L.Y., 11:29826
Sahrman, K., *See* Laine, R., 11:29490
Saint-Cloud, J.P., *See* Brossard, J., 11:29798
Sakai, N., Proton decay in supersymmetric models, 11:30871 (RA;JP)
Salati, E., *See* Hedges, J.I., 11:30605
Salazar, K.V., *See* Hay, P.J., 11:30316
Salbeck, R.E., *See* Kaifer, R.C., 11:30432
Saleh, M.A.E., Daily thermal storage for heating and cooling of buildings, 11:29590 (RA;US)
Solar radiation on different oriented vertical surfaces: Riyadh case study, 11:29498 (RA;US)
Salin, J.-G., Physical properties of spent liquor from chemical pulping processes, 11:30028 (R;FI;In Finnish)
Salisbury, C., *See* Milde, H., 11:29706
Salminen, H., *See* Tuominen, A., 11:30024
Salsman, J.M., Considerations for creating a free-standing monolith, 11:29338 (RA;US)
Salter, S.O., Ethylene and the growth of rice seedlings, 11:30676 (J;US)
Saluja, P.P.S., Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)
Salvetat, G., *See* Clerc, M., 11:29290
Samskog, P.O., Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Sanborn, Y., *See* Greene, G.A., 11:29829
Sandberg, E., *See* Ernstsson, G., 11:29918
Sandberg, V.D., *See* Bolton, R.D., 11:30491
Sander, R. K., *See* Glownia, J. H., 11:30369
Sanders, R.D. Sr., *See* McConnell, J.W. Jr., 11:30154
Sanders, T.L., *See* Berger, J.D., 11:29306, 11:29307
Sandoval, J.P., *See* Bolton, R.D., 11:30491
Sands, M., Centrifugal space-charge forces in SLC, 11:30414 (R;US)
Sannier, J., *See* Cayla, O., 11:30077
Santoro, R.T., Magnetics calculations for an ELMO Bumpy Square, 11:31180 (J;US)
Sapko, M.J., *See* Weiss, E.S., 11:29260
Sarangi, S., *See* Barclay, J.A., 11:30360
Sarmadi, H., *See* Bergshoeff, E., 11:30881
Saroha, D.R., *See* Gupta, R.K., 11:30908
Sartorio, R., *See* Miller, D.G., 11:30198
Sasaki, Misao, Problems in the perturbation analysis of a universe dominated by a coherent scalar field, 11:30778 (RA;JP)
Sasse, L., Biogas supply for the fictitious village of Kama in India. Case study, 11:29462 (RA;DE)
Sathrum, C., *See* Baudisch, H., 11:29382
Sato, Humitaka, Scenarios of galaxy formation, 11:30774 (RA;JP)
Sato, Katsuhiko, Inflationary universe model, 11:30777 (RA;JP)
Sato, T., Numerical flow analysis for axial flow turbine, 11:30036 (RA;JP)
Sattelberger, A.P., *See* Hay, P.J., 11:30316
See Wrobleski, D.A., 11:30319
Sauer, K., *See* Boska, M., 11:30643
See Karukstis, K.K., 11:30642
Sauer, M.C. Jr., $O(^3P)$ atoms formation by the photolysis of hydrogen

peroxide in alkaline aqueous solutions, 11:30299 (J;US)
See Denison, L.S., 11:30250
See Trifunac, A.D., 11:30304
Sauer, R.E., Commercial regional incinerator facility for treatment of low-level radioactive waste, 11:29385 (RA;US)
Saunders, G.L., *See* Szabo, M.F., 11:29736
Sawan, M.E., *See* El-Guebaly, L.A., 11:31148
See Nagy, M.E., 11:30944
See Youssef, M.Z., 11:31032
Sawyer, D.L., *See* Kaifer, R.C., 11:30432
Sawyer, R.F., *See* Parker, T.E., 11:30033
Saxon, D.H., Jet fragmentation, 11:30875 (R;GB)
Schaefer, H.F. III, $F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
Schaich, K.M., *See* Borg, D.C., 11:30727
Schapira, J.P., *See* Azaiez, F., 11:30911
Schatz, A.L., *See* Law, A.G., 11:30617
Schavey, T.W., *See* Jones, K.B., 11:29388
Schechter, D.E., Erosion tests of materials by energetic particle beams, 11:31233 (J;US)
See Baity, F.W., 11:31026
Scheele, R.D., Leach resistance of iodine compounds in Portland cement, 11:29425 (J;US)
Schenkel, R., Demonstration of spent-fuel measurement equipment at KWO Obrigheim facility, 11:29766 (R;FR)
Scheppele, S. E., *See* Pavelka, E. A., 11:30110
Schiefelbein, G.F., Biomass thermochemical conversion program. 1985 annual report, 11:29486 (R;US)
Schieferdecker, H., Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)
Schiffer, M., *See* Short, M.T., 11:30635
Schiffhauer, M.A., Status of the waste removal system for the West Valley Demonstration Project, 11:29397 (RA;US)
Schindler, R.H., *See* Dubois, R., 11:30455
Schirber, J.E., *See* Emge, T.J., 11:30245
Schissel, D.P., Physics analysis database for the DIII-D tokamak, 11:31069 (R;US)
Schlachter, A.S., *See* Stearns, J.W., 11:31219
Schlafer, W., *See* Madsen, M.M., 11:30350
Schlereth, J., *See* Dawson, J., 11:30448
Schley, R., *See* Bourgault, F., 11:30075
Schloemer, E.C., *See* Cable, M.D., 11:30907
Schluter, R., *See* Yoshida, R., 11:30458
Schmelzer, F., Investigations of the vibrational corrosion of structural steels in seawater, 11:30095 (R;DE;In German)
Schmid-Haas, P., Swiss forest damage inventory of 1984, 11:30714 (RA;DE;In German)
Schmidt, F.W., *See* Hedges, J.I., 11:30605
Schmidt, H.R., Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
Schmidt, S. C., *See* Moore, D. S., 11:30516
Schmidt, W., *See* Liese, T., 11:30719
Schmiester, G., *See* Frank, K.H., 11:30111
Schmitt, F.J., *See* Schmelzer, F., 11:30095
Schmitt, R.C., Experiences in development, qualification, and use of concrete high-integrity containers in commercial disposal of radioactive wastes, 11:29359 (RA;US)
Schmitt, R.J., *See* Santoro, R.T., 11:31180
Schmor, P.W., Review of optically pumped polarized ion sources, 11:30418 (R;CA)
See Levy, C.D.P., 11:30416
Schneider, J.F., Parallel capillary column gas chromatography in the determination of chlorinated pesticides and PCBs, 11:30186 (J;US)
Schneider, K.J., Treatment strategies for transuranic wastes, 11:29412 (R;US)
Schnurmacher, G., *See* Kaplan, S.N., 11:30428
Schnurr, N.M., *See* Copenhaver, C., 11:31175
Schoepfer, W., Current damage situation in Baden-Wuerttemberg, 11:30707 (RA;DE;In German)
Reflections regarding the further development of forest decline inventories for large areas, 11:30712 (RA;DE;In German)
Schreiber, H., Overview of EPRI residual fuel oil combustion project plans, 11:29241 (RA;US)
Schroeder, H., *See* Packan, N.H., 11:30088
Schuck, P., *See* Suraud, E., 11:30936
Schull, W., *See* Abrahamson, S., 11:29449
Schulten, R., *See* Teuchert, E., 11:29775
Schultz, A.J., *See* Bruno, J.W., 11:30318
Schultz, D., *See* Ashford, V., 11:30449
Schultz, D.H., *See* Martin, G.F., 11:29851
Schultz, K.R., *See* Maya, I., 11:31216
See Wong R.F., 11:31104
Schulz, E., Trends of electricity consumption in the small consumers' sector of the Federal Republic of Germany, 11:29955 (RA;US)
Schulze, J., *See* El-Genk, M.S., 11:29864
Schumacher, B.J., Cryopumping hydrogen isotope mixtures in MFTF-B with and without argon adsorbent, 11:31254 (J;US)
Schumpert, D.E. Jr., *See* Jones, K.B., 11:29388
Schwartz, L.H., *See* Hong, F., 11:30229
Schwarz, H.A., Reactions of HO_2 and O_2^- with iodine and bromine and the I_2^- and I atom reduction potentials, 11:30202 (J;US)
Schwenterly, S.W., *See* Fietz, W.A., 11:31170
Scott, B.R., Early occurring and continuing effects, 11:29447 (RA;US)
Scott, D. G., *See* Holcombe, C. E., 11:30112
Scott, D.W., *See* Schiffhauer, M.A., 11:29397
Scott, M.L., Extreme ultraviolet multilayer reflectors, 11:30341 (R;US)
Scott, W.B., *See* Mullen, M.F., 11:29753
Scott-Monck, J., PASP: a high voltage array experiment, 11:29538 (RA;US)
Scrinzi, A., *See* Breunlich, W.H., 11:31077
Scripsick, R.C., Dissolution of uranium oxide materials in simulated lung fluid, 11:30309 (RA;US)
Seapan, M., *See* Crynes, B.L., 11:29159
Sears, D.R., *See* Dahlin, R.S., 11:29701
Seeley, R., *See* Fliflet, A.W., 11:31270
See Park, S.Y., 11:31269
Seely, D.B., Geothermal assessment in the Boaneville Power Administration service area, 11:29615 (RA;US)
Seestrom-Morris, S.J., Spin excitations in pion inelastic scattering, 11:30939 (BA;US)
Seez, C., *See* Hall, G., 11:30460
Segar, D.A., Oxygen depletion in the New York apex: causes and consequences, 11:30613 (J;US)
Seitz, M.G., *See* Vandegrift, G.F., 11:30586
Seitz, W.L., *See* Tang, P.K., 11:30512
Sekar, R.R., Advanced adiabatic diesel engine for passenger cars, 11:30045 (B;US)
Selkowitz, S., *See* Arasteh, D., 11:30003
Sells, J.E., *See* Oh, I., 11:29443
Seltzer, S., *See* Sonnewald, U., 11:30637
Semet, D., *See* Philippot, J., 11:29806
Semonin, R.G., *See* Doty, K.G., 11:30550
Sengler, G., *See* Duchene, J., 11:29756
Sennhauser, U., *See* Bolton, R.D., 11:30491
Senum, G.I., Fourier transform infrared spectroscopic study of the thermal stability of peroxyacetyl nitrate, 11:30256 (J;US)
Sermage, B., Comparison of Auger recombination in GaInAs-AlInAs multiple quantum well structure and in bulk GaInAs, 11:30156 (RA;AT)
Serne, R.J., *See* Peterson, S.R., 11:29441
Setlow, R.B., Saturation of repair, 11:30722 (BA;US)
Setser, D.W., Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)
Sevenich, G.J., Eluent and ligand effects in cation chromatography, 11:30185 (D;US)
Sezgin, E., *See* Bergshoeff, E., 11:30881
Shabtai, J.S., Hydrotreatment studies of Swedish peat products. Progress report No. 3 (Final), 11:29168 (R;SE)
Shack, W.J., *See* Park, J.Y., 11:29754
Shaffer, R.J., Quasi-static and dynamic arbitrary fracture propagation in jointed rock, 11:29252 (R;US)
Shannon, D.W., *See* Robertus, R.J., 11:29628
Shannon, J.D., Estimates of long-term trends in sulfur deposition, 11:30525 (R;US)
Shapiro, C.S., Local and global deposition of radioactivity: a reassessment, 11:30697 (R;US)
Shapiro, S., *See* Bird, F., 11:30478
Shappert, L.B., Drop testing at the Oak Ridge National Laboratory, 11:30333 (R;US)
See Rhyne, W.R., 11:29298
Sharkey, T.D., Gas exchange characteristics of leaves as indicators of the basic limitations to the rate of photosynthesis. Second annual report, 1 June 1985-31 May 1986, 11:29503 (R;US)
Sharp, P.H., *See* Apsimon, R.J., 11:30450
Sharples, F.E., *See* Petty, J.L., 11:29445
Shattuck, D.M., *See* Belba, V.H., 11:29734
Shaughnessy, E.J., Fluid dynamics of electrostatic precipitators: effects of electrode geometry, 11:29727 (RA;US)
See Davidson, J.H., 11:29725
Shu, C.Y., *See* Hsu, L.S., 11:30136

Sheffield, J., Cost assessment of a generic magnetic fusion reactor, 11:31085 (J;US)
Shell, T., *See* Myers, B., 11:30407
Shelnutt, J.A., Raman spectroscopy of polymers of metal protoporphyrin free acids on metal electrodes, 11:30283 (J;US)
Shen, S.S., *See* Lue, J.W., 11:31171
Shen Yongxun, *See* Qian Zeshu, 11:29469
Sheng, Y.P., *See* Lewellan, W.S., 11:30561
Shenoy, G.K., Rare-earth Moessbauer studies on chemical problems, 11:30228 (BA;US)
Shepard, R.L., *See* Dunning, T.H. Jr., 11:30206
Shephard, L.E., Geotechnical properties of fine-grained turbidite sequences: observations from the Nares Abyssal Plain, 11:30750 (R;US)
Shepherd, I.G., *See* Chang, R.K., 11:30324
Sheppard, M.T., Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Sheppard, S.C., Use of the food-chain model FOOD III and the soil model SCEMR to assess irrigation as a biosphere pathway, 11:30579 (R;CA)
Sherman, L.A., *See* Pakrasi, H.B., 11:30671
Sherman, M., Description of ASHRAE's proposed data tightness standard, 11:30000 (R;US)
See Kiel, D., 11:30002
Sherow, J.D., *See* Crynack, R.R., 11:29698
Sherwood, A.E., *See* Moir, R.W., 11:31103, 11:31143
Sherwood, E.G., *See* Rej, D.J., 11:31263
Shewfelt, R.W.S., Verification tests of a high-temperature transverse creep model for Zr-2.5 wt % Nb pressure tubes, 11:30070 (R;CA)
Shiao, S.Y., Ion-exchange properties of activated carbon filled with hydrous Zr(IV) and Zr(IV)-P(V) oxides, 11:30174 (J;NL)
Shibata, Keiichi, Evaluation of neutron nuclear data of ^{6}Li for JENDL-3, 11:30901 (R;JP)
Evaluation of neutron nuclear data of ^{7}Li for JENDL-3, 11:30902 (R;JP)
Evaluation of neutron nuclear data of ^{9}Be for JENDL-3, 11:30903 (R;JP)
Neutron nuclear data of ^{7}Ni adopted in JENDL-2, 11:30899 (R;JP)
Neutron nuclear data of ^{9}Be adopted in JENDL-2, 11:30900 (R;JP)
Shield, P., *See* Dawson, J., 11:30448
Shimada, M., *See* Kahn, C., 11:30989
Shimer, D.W., *See* Owen, E.W., 11:31187
Shimizu, Y., Physics with high energy accelerators in the future, 11:30830 (RA;JP)
See Hirabayashi, H., 11:30831
Shimshock, J.P., *See* Lewin, E.E., 11:30546
Shimura, M., *See* King, R.B., 11:30231
Shin, K., Neutronics scaling in fusion test devices, 11:31156 (J;US)
See Abdou, M.A., 11:31086
See Garner, J.K., 11:31152
See Gierszewski, P., 11:31158
Shipley, S.T., *See* Browell, E.V., 11:30538
Shipman, J.D., *See* Boller, J.R., 11:31265
Shirahashi, A., *See* Itoh, R., 11:30453
Shor, J. T., *See* Carey, A. A., 11:29249
Shores, D. A., *See* Iacovangelo, C. D., 11:29985
Short, M.T., Comparison of chromatographic characteristics of a series of homologous Bence-Jones proteins during size-exclusion chromatography by high-performance liquid chromatography and by Sephadex, 11:30635 (J;NL)
Shugart, H.H., *See* Emanuel, W.R., 11:30572
See Solomon, A.M., 11:30574
Shukla, Y., *See* Shabtai, J.S., 11:29168
Shul, R.J., *See* Upschulte, B.L., 11:30212
Shyke, A., *See* Young, F.C., 11:31268
Sicre, A., Mass energy correlation measurement in ^{252}Cf spontaneous fission, 11:30927 (R;FR;In French)
Siddiqi, A.A., Overview of environmental design methodologies and problems related to passive low energy architecture, 11:29586 (RA;US)
Siders, P., *See* Cave, R.J., 11:30240
Siegel, R.B., Optical effects of thin film adhesives in multijunction solar cells, 11:29549 (BA;US)
Siegmund, C.W., *See* Griffith, M.G., 11:29239
Siekhaus, W.J., *See* Balooch, M., 11:30161, 11:30199
Siemon, R.E., Invited paper: confinement scaling, equilibrium, and stabilization studies in FRX-C, 11:31264 (BA;US)
See Rej, D.J., 11:31263
Sienkiewicz, C.J., Surface tritium contamination studies, 11:29437 (RA;US)
Tritium surface contamination, 11:31102 (J;US)
Sigmar, D.J., *See* Sutton, W.R., 11:31007
See Vahala, L., 11:30991
Siitonen, H., Possibilities of using sludge for energy purposes, 11:30027 (R;FI;In Finnish)
Silfvast, W.T., Photoionization lasers pumped by broadband soft-X-ray radiation from laser-produced plasmas, 11:30372 (BA;US)
Silver, E.G., Nuclear Safety: technical progress review, April-June 1986. Volume 27, No. 2 , 11:29866 (R;US)
Silver, H.F., *See* Hurtubise, R.J., 11:29175
Silverberg, T.C., *See* Oh, I., 11:29443
Silverman, I.R., Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)
Silverman, J., *See* Neta, P., 11:30252
Siman-Tov, M., *See* Llewellyn, G.H., 11:30106
Simmons, M.A., *See* McKenzie, D.H., 11:29446
Simnett, G.M., *See* Harrison, R.A., 11:30789
Simon, G., *See* Trochon, J., 11:30926
Simon, S., *See* Loo, B.W., 11:30665
Simonen, T.C., *See* Turner, W.C., 11:31259
Simpson, D.B., RISKMAN3: an interactive computer code to assist in the review and quantification of system analyses, 11:29867 (R;US)
Simpson, H.J., *See* Linsalata, P., 11:30619
Simpson, I.C., Literature review of fire modelling techniques and related subjects, 11:29865 (R;GB)
Simpson, J.J., *See* Fife, K.W., 11:29294
Sims, C.W., *See* Giorgi, A.E., 11:29494
See Prentice, E.F., 11:30685
Sinclair, A., MINO feasibility study. Concluding report, 11:29153 (R;SE)
Singer, C.E., *See* Mikkelsen, D.R., 11:31008
Singer, C.R., *See* Braams, B.J., 11:30987
Singer, M.E., *See* Finnerty, W.R., 11:29247
Singh, J.P., Fracture toughness of $MgCr_2O_4$-ZrO_2 composities, 11:30133 (BA;US)
Singh, N.K., Proteins associated with adaptation of cultured tobacco cells to NaCl, 11:30644 (J;US)
Sinha, S.K., *See* Fedro, A.J., 11:30954
Siotis, I., *See* Hall, G., 11:30460
Siskind, B., Extended storage of low-level radioactive waste: potential problem areas, 11:30079 (RA;US)
Sivco, D., *See* Sermage, B., 11:30156
Sjoeberg, B., *See* Sundberg, L., 11:29644
Skinner, C.H., Model for electron cooling by radiation losses in plasmas: application to soft x-ray laser development, 11:31078 (R;US)
See Clark, C.W., 11:30365
Skinner, G.B., Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Skinner, M.F., Novel design concepts for an 860 MW fabric filter used with a dry flue gas desulfurization system, 11:29730 (RA;US)
Sklarew, D.S., *See* Olsen, K.B., 11:30224
Skudelny, H.C., Investigations of three-phase current drives for electric battery cars. Vol. 1. Fundamental principles, system studies and results of experimental studies, 11:30062 (R;DE;In German)
Slack, D.S., *See* Henning, C.D., 11:31123
Slatkin, D.N., Distribution of sulfhydryl boranes in mice and rats, 11:30658 (R;US)
Sliney, H.E., *See* DellaCorte, C., 11:30091
Slovik, G.C., *See* Neymotin, L.Y., 11:29826
Sluss, F., *See* Schechter, D.E., 11:31233
Smaga, J.A., *See* Batt'es, J.E., 11:29898
Smalley, J.F., Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene, 11:30287 (J;US)
Smalley, R.E., *See* Zhang, Q.L., 11:30248
Smith, C.A., *See* Chisholm, M.H., 11:30210
Smith, C.H., *See* Smith, R.E., 11:30176
Smith, D.L., Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
See Cha, Y.S., 11:31105
See Chopra, O.K., 11:31039, 11:31040, 11:31098
See Davis, J.W., 11:31100
See Diercks, D.R., 11:31041
See Loomis, B.A., 11:31056
Smith, F.K., *See* Carr, R.W. Jr., 11:30286
Smith, G.C., *See* Fischer, J., 11:30422, 11:30459
See Woody, C.L., 11:30451
Smith, G.M., *See* Bruno, J.W., 11:30318
Smith, G.P., *See* Chapman, D.M., 11:30244
See Jeffries, J.B., 11:30208
Smith, K.R., Mobile incineration services at Commonwealth Edison's nuclear stations, 11:29381 (RA;US)
Smith, M.F., Thermomechanical testing of beryllium for limiters in ISX-B and jet, 11:31238 (J;US)

Smith, O.L., PWR hybrid computer model for assessing the safety implications of control systems, 11:29858 (R;US)
See Stone, R.S., 11:29854
Smith, R.D., *See* Yonker, C.R., 11:30182
Smith, R.E., Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)
Smith, S.A., Cellular automata in cytoskeletal lattices, 11:30639 (J;NL)
Smith, S.R., Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
Smith, W.L., Microscopic image analysis of slow crack growth in vitreous materials, 11:30388 (R;US)
Smokler, M.I., Block V module development and test results, 11:29554 (BA;US)
Snell, M.K., Improving security communications at fixed-site facilities, 11:29454 (R;US)
Snow, A.L., *See* Jones, K.B., 11:29388
Snyder, A.M., Tokamak Fusion Core Experiment maintenance study, 11:31108 (J;US)
Snyder, B.J., Revised worker exposure estimates for TMI-2 radioactive waste processing and decontamination, 11:29442 (RA;US)
Snyder, T.R., *See* Bush, P.V., 11:29719
Soderberg, W., *See* Buschmann, J.C., 11:29194
Soderholm, S.C., *See* Scripsick, R.C., 11:30309
Soderstrom, E.J., *See* Brown, M.A., 11:30019
Sofrata, H., Solar thermoelectric cooling system, 11:29570 (RA;US)
Solar-powered dual cycle absorption cooling system, 11:29576 (RA;US)
Solanes, F., *See* Basso, M., 11:29594
Solaun, S., *See* Anderson, W.A., 11:29531
Solley, W.B., Estimated use of water in the US in 1980, 11:30603 (R;US)
Solomey, N., *See* Dawson, J., 11:30448
Solomon, A.M., Integrating forest-stand simulations with paleoecological records to examine long-term forest dynamics, 11:30574 (BA;SE)
Soltwisch, H., *See* Bruessau, W.D., 11:30973
Somerville, C., *See* Caspar, T., 11:30627
Somerville, C.R., *See* McCourt, P., 11:30630
Sommer, H.A., *See* Walton, J.T., 11:30430
Sommer, H.E., *See* Lee, N., 11:30679
Sommer, W.F., *See* Yu, J., 11:31075
Somuah, C.B., *See* Burke, A.F., 11:30065
Sondheim, W.E., *See* Kapustinsky, J.S., 11:30489
See Sunier, J.W., 11:30490
Song, C.L., *See* Blaise, A., 11:30152
Soonewald, U., [Mesityl]bacteriorhodopsin. The properties of an analogue of the purple membrane containing [mesityl]retinal as the chromophore, 11:30637 (J;GB)
Soper, D.E., *See* Berger, E.L., 11:30848
Sorensen, J.H., *See* Brown, M.A., 11:30019
Sorey, M.L., Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings, 11:30747 (R;US)
Sorini, S.S., *See* McGowan, L.J., 11:29285
Sornjitti, P., Promotion of biogas in rural Thailand by the Population and Community Development Association (PDA), 11:29476 (RA;DE)
Sort, M., Steam generator replacement, 11:29772 (R;FR)
Soto, R., Mobile liquid VR system: a cost effective alternative, 11:29349 (RA;US)
Soulie, E., *See* Blaise, A., 11:30152
Souza, I.O. de, *See* Barros, S. de, 11:30928
Sozer, A., *See* Smith, O.L., 11:29858
Spaletta, H.W., *See* McConnell, J.W., Jr., 11:29362
Spampinato, P.T., Maintainability features of the compact ignition tokamak, 11:31031 (R;US)
Spanner, J.C., *See* Triggs, T.J., 11:29792
Sparks, L., *See* Durham, M., 11:29711
See Rinard, G., 11:29712
Sparks, L.E., Removal of sulfur dioxide and particulate using E-SOX, 11:29733 (RA;US)
See Bush, D.V., 11:29716
See Damle, A.S., 11:29193
See Ensor, D.S., 11:30528
See Faulkner, M.G., 11:29696
See Landham, E.C. Jr., 11:29714
See Lawless, P.A., 11:29699
See McLean, K.J., 11:29718
See Viner, A.S., 11:29691
See Young, R.P., 11:29720
Sparks, W.M., *See* Starrfield, S., 11:30785
Spatz, R., *See* Hawighorst, A., 11:29842
Spear, R.H., *See* Fewell, M.P., 11:30910, 11:30919
Spector, G.B., *See* Brady, B.B., 11:30290
Spencer, H.W. III, *See* Krigmont, H., 11:29707
Speranzini, R.A., Development of sphene-based glass-ceramics for disposal of some Canadian wastes, 11:29427 (J;US)
Sperling, L.H., Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
Spettell, C.M., *See* Ross, E.A., 11:29853
Spicer, L. D., Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
Spicer, L.D., *See* Liang, J., 11:30214
Spindler, B., How handy is Weibull or, the use of failure distributions in the planning and analysis of battery experiments?, 11:29900 (RA;US)
Spinney, P., Washington State Solar Bank Program. A comprehensive 1984-85 program evaluation, 11:29605 (R;US)
Spiro, C.L., *See* Maylotte, D.H., 11:29156
Spitzen, M.B., High efficiency flat-plate module research, 11:29551 (BA;US)
Spitzer, M.B., Further research on high open circuit voltage in silicon solar cells, 11:29518 (RA;US)
Spitznagel, J.A., Response of selected high strength high conductivity copper alloys to simulated fusion irradiation and temperature conditions, 11:31035 (RA;US)
Spivey, J.J., *See* Kashdan, E.R., 11:29728
Spore, J., *See* Cappiello, M., 11:29844
Spore, J.W., TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Springer, D.L., *See* Wright, C.W., 11:30725
Springer, S.A., *See* Outlaw, W.H. Jr., 11:30634
Squitieri, R., Electricity use in the US commercial sector 1960-2000, 11:29959 (RA;US)
Srivastava, P.C., Design, synthesis and evaluation of redox radiopharmaceuticals: a potential new approach for the development of brain imaging agents, 11:30651 (R;US)
Staffansson, H., Variation of bulk density in Swedish peat bogs, 11:29203 (R;SE;In Swedish)
Stalick, W.M., *See* Mushrush, G.W., 11:29274
Stallings, R.L., Assignment of genes encoding metallothioneins I and II to Chinese hamster chromosomes 3. Evidence for the role of chromosome rearrangement in gene amplification, 11:30724 (J;US)
Stamps, R.E., *See* Fietz, W.A., 11:31170
Stangeby, P.C., *See* Kilpatrick, S.J., 11:30980
Starrfield, S., Hydrodynamic models for novae with ejecta rich in oxygen, neon and magnesium, 11:30785 (R;US)
Stasko, R.R., *See* Sumpinato, P.T., 11:31131
Stathopoulos, D., Automatic measurement of characteristic quantities of nuclear plasma, 11:30968 (R;FR;In French)
Staudhammer, K.P., Technique for megabar controlled strain experiments, 11:30098 (R;US)
Stearns, J.W., Collisonal pumping for the production of intense spin-polarized neutral BEAMS: target considerations, 11:31219 (J;US)
Steele, J.P.H., *See* Palmquist, R.D., 11:30351
Steele, W.G., *See* Meier, W.R., 11:31210
Steffen, J. M., *See* Christiansen, D. W., 11:29808
Stein, L., Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Stein, S.L., *See* Treat, R.L., 11:29379
Stein-Schabes, J.A., Non-static vacuum strings: exterior and interior solutions, 11:30767 (R;US)
See Jensen, L.G., 11:30765
Steinitz, B., Blue and green light-induced phototropism in Arabidopsis thaliana and Lactuca sativa L. seedlings, 11:30683 (J;US)
Stella, P.M., Interplanetary exploration-A challenge for photovoltaics, 11:29456 (RA;US)
Stenberg, D.R., *See* Gonzales, A., 11:30349
See Madsen, M.M., 11:30350
Stenberg, V.I., *See* Montano, P.A., 11:30257
Stenner, R.D., *See* Hawley, K.A., 11:29450
Stephan, B., Variants of biogas supply for the fictitious village of 'Rima', South East Asia, (threshold country). Case study, 11:29463 (RA;DE)
Stephanakis, S.J., *See* Boller, J.R., 11:31265
See Young, F.C., 11:31268
Stephens, D.R., The Centralia partial seam CRIP underground coal gasification experiment, 11:29172 (B;US)

Stephens, J.R., Thermal aging effects in refractory metal alloys, 11:29786 (R;US)
Stephenson, L., Marketable transport fuels from Julia Creek shale oil, 11:29273 (BA;US)
Sterman, G., *See* Berger, E.L., 11:30848
Stern, T.A., *See* Paintin, J.K., 11:29202
Stetkar, J.W., *See* Simpson, D.B., 11:29867
Stevens, D.J., *See* Schiefelbein, G.F., 11:29486
Stevens, F.J., *See* Short, M.T., 11:30635
Stevens, H.C., *See* Ehst, D.A., 11:31197
Stevenson, M.P., *See* Emanuel, W.R., 11:30572
Stevenson, W.H., R and D needs in wind energy - a utility's view based on experience, 11:29646 (RA;GB)
Steward, S.A., *See* Musket, R.G., 11:30113
Stewart, C.C., *See* Walker, E.B., 11:30646
Stewart, C.R., Relationship between stress-induced ABA and proline accumulations and ABA-induced proline accumulation in excised barley leaves, 11:30675 (J;US)
Stewart, D.B., *See* Bredehoeft, J.D., 11:29401
Stewart, H.D., *See* Krantz, E.A., 11:29834
Stewart, H.E., *See* Parker, T.E., 11:30033
Stewart, J.M., Near infrared imaging of galaxies, 11:30793 (RA;GB)
Stewart, L.D., *See* Kim, J., 11:30999
Stewart, M.E., Database tools for enhanced analysis of TMX-U data. Revision 1, 11:30984 (R;US)
Stewart, W.F., *See* Barclay, J.A., 11:30360
Stewart-Osten, A., Stochastic models for predicting environmental impact in aquatic ecosystems, 11:30615 (RA;US)
Stiger, S.G., INEL injection research: physical model studies, 11:29911 (RA;US)
Stinton, D.P., Chemical vapor infiltration of fiber-reinforced ceramic composites, 11:30143 (R;US)
Simultaneous chemical vapor deposition of SiC-dispersed phase composites, 11:30131 (BA;US)
See Caputo, A.J., 11:30130
Stirling, W.L., *See* Dagenhart, W.K., 11:31200
See Whealton, J.H., 11:31010
Stock, D.E., *See* Kallio, G.A., 11:29700
Stockdale, J.A.D., *See* Hamadani, S.M., 11:30811
Stockman, H.W., *See* Westrich, H.R., 11:29639
Stoltsov, M.V., *See* Petkov, I.Zh., 11:30932
Stokstad, R.G., *See* Schmidt, H.R., 11:30482
Stone, C.M., *See* Costin, L.S., 11:30386
See Wawersik, W.R., 11:30753
Stone, J.A., *See* Jantzen, C.M., 11:29428
Stone, R.S., Assessment of the safety implications of control at the Oconee 1 nuclear plant. Final report, 11:29854 (R;US)
Storm, E., Progress in inertial fusion at LLNL, 11:31217 (J;US)
Storton, J.M., TMI-2 defueling filter development tests, 11:29762 (RA;US)
See Jacob, N.P., 11:29392
Stow, S.H., Monitoring of surface deformation and microseismicity applied to radioactive waste disposal through hydraulic fracturing at Oak Ridge National Laboratory, 11:29376 (RA;US)
See Haase, C.S., 11:29375
Straalsund, J.L., Interactive effects and fluence goals, 11:31246 (J;US)
Strachan, D.M., *See* Grambow, B., 11:29429
Street, R.A., *See* Kaplan, S.N., 11:30428
See Perez-Mendez, V., 11:30425
Strickler, D.J., Impact of a poloidal divertor in ignition tokamak design, 11:31186 (J;US)
Striker, R. P., *See* Dunn, J. C., 11:29624
Strode, J.N., *See* Allen, C.R., 11:30340
Strojan, C.L., Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Division of Stress and Wildlife Ecology FY-1985 highlights, 11:30570 (RA;US)
Division of Wetlands Ecology FY-1985 highlights, 11:30569 (RA;US)
Struble, L.J., Inorganic compounds for passive solar energy storage. Solid-state dehydration materials and high specific heat materials. Progress report, 11:29612 (R;US)
Stuchbery, A.E., *See* Byrne, A.P., 11:30922
See Gerl, J., 11:30916
See Poletti, A.R., 11:30920
See Poletti, S.J., 11:30921
Studebaker, I.C., Mining strategy effects on oil shale profitability, 11:29261 (BA;US)
Stuehrenberg, L.C., *See* Giorgi, A.E., 11:29494
Stuermer, D.H., *See* Hatch, F.T., 11:30726
Stuka, M., *See* Chou, J.S., 11:30300
Stull, E.A., Comparison of land and ocean disposal alternatives for bulk wastes containing naturally occurring radionuclides, 11:29339 (RA;US)
Suagee, D.B., Microhydropower development in the United States: a demonstration project, 11:29492 (BA;CA)
Subramanian, A., *See* Moulik, T.K., 11:29500
Subudhi, M., Seismic and dynamic qualification of safety related electrical and mechanical equipment, 11:29850 (R;US)
Suckower, S., *See* Clark, C.W., 11:30365
Sudlag, P.H., Data on energy use in the commercial sector of the Federal Republic of Germany, 11:29961 (RA;US)
Sudworth, J.L., Overview of battery testing in the UK, 11:29882 (RA;US)
Rapid testing of beta alumina ceramics, 11:29893 (RA;US)
Suffridge, F.E., Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)
Sugarbaker, E., *See* Taddeucci, T.N., 11:30487
Sugawara, H., *See* Arafune, J., 11:30822
Sullivan, J.C., *See* Choppin, G.R., 11:30320
Sullivan, R.G., *See* Robertus, R.J., 11:29628
Sumida, D., *See* Chou, J.S., 11:30300
Summers, M. A., Scattering apodizer for laser beams, 11:30366 (P;US)
Sumpinato, P.T., A comparison of all-remote and personnel access maintenance operations for INTOR, 11:31131 (J;US)
Sundbeck, C.W., *See* Griffith, R.V., 11:30951
Sundberg, L., Measurements of TV-interference from the wind power plant at Maglarp, 11:29644 (R;SE;In Swedish)
Sunderman, F.W. Jr., Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
Electrothermal atomic absorption spectrophotometry of nickel in tissue homogenates, 11:30654 (J;US)
Sunier, J.W., CALLIOPE - a large acceptance multiparticle magnetic spectrometer for intermediate energy physics, 11:30490 (J;NL)
See Kapustinsky, J.S., 11:30489
Suraud, E., Towards temperature dependant nuclear forces for the description of hot nuclei, 11:30936 (R;FR)
Surlyk, F., *See* Alvarez, W., 11:30573
Suter, G.W. II, *See* Barnthouse, L.W., 11:30601
Sutherland, A.A., Calculation of dose rates from critical radionuclides in low-level radioactive waste disposal, 11:29444 (RA;US)
Sutherland, J.W., *See* Michael, J.V., 11:30209
Sutherland, R.J., Effect of distance on the preservation value of water quality, 11:29907 (J;US)
Sutin, N., *See* Brunschwig, B.S., 11:30292
See Keene, F.R., 11:30225
Sutter, H., *See* Grom, R., 11:29351
Sutton, W.R., Alpha-driven fast magnetosonic wave heating in tokamak plasmas, 11:31007 (J;US)
Suuberg, E.M., *See* Calo, J.M., 11:29160
Svenningsson, P.J., Gasification of sod peat in a fixed bed cocurrent gasifier, 11:29169 (R;SE)
Svensson, T., Resonance compensation of wind power plants with variable rotor speed, 11:29668 (R;SE;In Swedish)
Sviatoslavsky, I.N., First wall and blanket design for a high wall loading compact tokamak power reactor, 11:31151 (J;US)
Swain, D.W., *See* Glowienka, J.C., 11:31013
Swaja, R.E., Effective threshold cross sections for sulphur and indium fast neutron reactions, 11:30493 (J;GB)
Swanberg, C.A., *See* Hinze, W.J., 11:29622
Swanenburg de Veye, R.J., *See* Chrysochoides, N.G., 11:29820
Swank, W.D., *See* Demuth, O.J., 11:29629
Swanson, B.I., Optical spectroscopic studies of heme proteins at high pressure, 11:30253 (J;US)
Swanson, D.G., Mode conversion of lower hybrid waves at high ion cyclotron harmonics. Appendix F, 11:30963 (R;US)
Theoretical studies of the heating of toroidal plasmas with radiofrequency electromagnetic radiation. Progress report, July 1, 1985-June 30, 1986, 11:30965 (R;US)
Swanson, J.L., *See* Schneider, K.J., 11:29412
Swartz, C.K., *See* Curtis, H.B., 11:29536
See Weinberg, I., 11:29532
Swartzman, G.L., Using aquatic simulation models for impact assessment:

evaluation of monitoring programs, 11:30614 (RA;US)
Sweeney, M.A., Bremsstrahlung shielding analysis of the particle beam fusion accelerator PBFA II, 11:31220 (J;US)
Improved shielding calculations for the particle beam fusion accelerator PBFA II, 11:31080 (R;US)
Sweeny, P., *See* Montano, P.A., 11:30257
Swenson, D.O., *See* Skinner, M.F., 11:29730
Swift, R.P., *See* Shaffer, R.J., 11:29252
Swift-Hook, D.T., Priority areas for underlying research, 11:29652 (RA;GB)
Swingle, J. C., *See* George, E. V., 11:30504
Switek, J., *See* Stow, S.H., 11:29376
Sypkens-Smit, A.T., Electricity consumption in the tertiary sector (The Netherlands), 11:29952 (RA;US)
Szabo, M.F., Comparison of US and Japanese practices in the specification and operation and maintenance of electrostatic precipitators, 11:29735 (RA;US)
Operation and maintenance manuals for electrostatic precipitators and fabric filters, 11:29736 (RA;US)
See Carvitti, J., 11:29741
Szajdzinska-Pietek, E., *See* Jones, R.R.M., 11:30242
Sze, D.K., A molten salt cooling 17Li-83Pb breeding blanket concept, 11:31140 (J;US)
An assessment of problems associated with tritium containment, 11:31096 (J;US)
Counter current extraction system for tritium recovery from 17Li-83Pb, 11:31144 (J;US)
See Chopra, O.K., 11:31098
See Finn, P.A., 11:31196
Szo, D.K., *See* Cha, Y.S., 11:31105
Szukala, M., *See* Baudisch, H., 11:29382

T

Tasni, R., Jordan's first solar-heated house, 11:29599 (RA;US)
Taback, H., Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)
Taber, J.J., *See* Heller, J.P., 11:29234
Taddeucci, T.N., Neutron polarimeter for (p, n) measurements at intermediate energies, 11:30487 (J;NL)
Tadlock, W.E., Gas generation measurements on tritiated waste materials, 11:29438 (RA;US)
Taghavi, K., Test requirements for solid breeder blanket thermal behavior, 11:31134 (J;US)
See Garner, J.K., 11:31152
See Gierszewski, P., 11:31158
See Liv, Y.Y., 11:31137
See Madrame, H., 11:31113
Taha, I.S., *See* Elsayed, M.M., 11:29572
Taha, M.M.A., *See* Khalifa, A.M.A., 11:29591
Tait, G.D., *See* Efthimion, P., 11:31004
Tait, P.J., *See* Chong, Y., 11:29270
Tajima, T., High energy laser plasma accelerators, 11:31093 (J;GB)
Takacs, P.Z., *See* Church, E.L., 11:30955
Takahara, Fumio, Current status of missing mass problem, 11:30773 (RA;JP)
Takahashi, H., *See* Powell, J.R., 11:29784
Takahashi, S., Overview of rechargeable battery testing in Japan, 11:29883 (RA;US)
See Nakamura, O., 11:29673
Takahashi, T., *See* Itoh, R., 11:30453
Takahashi, H., Reactivation coefficient of muon-catalyzed deuterium-tritium fusion and its enhancement, 11:31089 (J;US)
Takayasu, M., Assessment of atmospheric fluidised bed combustion techniques, 11:29219 (R;GB)
Takeshita, Seiichiro, Mass hierarchies of quarks and leptons in a supersymmetric SP(2N) subcolor theory, 11:30864 (R;JP)
Taki, S., Numerical simulation method for combustion in an oxyhydrogen rocket motor, 11:30281 (RA;JP)
Tallent, O.K., Fixation of waste materials in grouts. Part II. An empirical equation for estimating compressive strength for grouts from different wastes, 11:29409 (R;US)
Tam, S.W., *See* Liu, Y.Y., 11:31097
See Liv, Y.Y., 11:31255
Tamura, N., *See* Radmer, R., 11:29502
Tanaka, M., *See* Rowcliffe, A.F., 11:31050
Tanaka, O., *See* Masuda, S., 11:29721
Tang, J., *See* Kispert, L.D., 11:30272
Tang, M., Plateau monsoons of the northern hemisphere: a comparison between North America and Tibet, 11:30522 (J;US)
Tang, P.K., Effects of physical properties on the initiation behaviors of heterogeneous high explosives, 11:30512 (R;US)
Tangler, J.L., Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats, 11:29662 (RA;DE)
Tanihata, I., Measurements of interaction cross sections and radii of He isotopes, 11:30895 (R;JP)
Tanihata, Isao, Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions, 11:30906 (R;JP)
Experiments using beams of unstable nuclear isotopes. Interaction cross sections and the radii of He isotopes, 11:30894 (R;JP)
Tanner, J.E., *See* McKinnon, M.A., 11:29303
Tarczynski, M.C., *See* Outlaw, W.H. Jr., 11:30634
Tarjanne, R., *See* Korpela, T., 11:30029
See Tuominen, A., 11:30024
Tarski, J., Cosmic numbers and quantum theory, 11:30768 (R;XA)
Tas, A., *See* Chrysochoides, N.G., 11:29820
Tassicker, O.J., *See* Ciliberti, D.R., 11:29688
See Lippert, T.E., 11:29687
Tattersall, R.B., Reactivity change measurements on plutonium uranium oxide fuel clusters in a plutonium uranium metal lattice in HECTOR, 11:29814 (R;GB)
Taylor, F., *See* Theodore, L., 11:29745
Taylor, F.G., Retention of simulated fallout particles by lichens and mosses, 11:30587 (J;US)
Taylor, G., *See* Efthimion, P., 11:31004
Taylor, G.E., *See* Dillmann, C.W., 11:29355
See McLaughlin, S.B., 11:30555
Taylor, L.T., Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985, 11:29183 (R;US)
Taylor, L.V., *See* Watson, N.D., 11:30426
Taylor, M., *See* Mathew, P.M., 11:30071
Taylor, N.A., *See* Simpson, I.C., 11:29865
Taylor, N.P., *See* Baker, L.J., 11:30889
Taylor, R.H., R and D on wind power in the CEGB, 11:29649 (RA;GB)
Taylor, R.J., *See* Davies, P.G., 11:29643
See Park, H., 11:31015
Taylor, R.W., Nitric oxide (NO) emissions from combustion of retorted oil shale, 11:29282 (BA;US)
Taylor, S.R., *See* Vergino, E.S., 11:30518
Tegth, U., *See* Sundberg, L., 11:29644
Telesco, C.M., Infrared emission and extragalactic starbursts, 11:30797 (RA;GB)
Teller, E., Opening remarks: basic quark considerations, 11:30942 (BA;US)
Temma, T., Image processor architectures and a data-driven image processore: TIP-1, 11:31281 (RA;JP)
Templin, R.J., Aerodynamic calculational methods for curved-blade Darrieus VAWT WECS, 11:29663 (RA;DE)
Tenforde, T.S., Biological effects of stationary magnetic fields, 11:30733 (BA;US)
Mechanisms for biological effects of magnetic fields, 11:30734 (BA;US)
Ternoey, S.E., Design of energy-responsive commercial buildings, 11:30005 (RA;US)
Terrell, M.S., Solving sampling problems, 11:29371 (RA;US)
Tester, J.W., Inert and reacting tracers for reservoir sizing, 11:29632 (RA;US)
Teuchert, E., Closed thorium cycles in the pebble bed HTR, 11:29775 (R;DE)
Thayer, A.M., Zero-field nuclear magnetic resonance of a nematic liquid crystal, 11:30239 (J;US)
Theodore, L., Electrostatic precipitator EUS section failure: operation and maintenance, 11:29745 (RA;US)
Thessen, G., *See* Svenningsson, P.J., 11:29169
Thibault, D.H., *See* Sheppard, M.T., 11:29430
Thie, J.A., Review of the OECD specialist meeting on continuous monitoring techniques for assuring coolant circuit integrity, 11:29870 (J;US)
Thiery, C., Use of a medical scanner for non-destructive control of composite materials, 11:30382 (R;FR;In French)
Thimsen, D., Synthetic fuel gas from petroleum coke-performance in an industrial gasifier, 11:29238 (BA;US)
Thirring, W., Stability of matter, 11:30806 (R;AT;In German)
Thoeming, G., Current Energy Patents: a current awareness journal, 11:31274 (J;US)

Thom, W.O., *See* Evangelou, V.P., 11:29192
Thomas, D.M., Current profile diagnostic development on text using the Zeeman effect, 11:31014 (BA;US)
See West, W.P., 11:30972
Thomas, J.J., User interaction model for manipulation of large data sets, 11:31294 (BA;US)
Thomas, J.M., Statistical approaches for quantitatively assessing ecological impacts and risks, 11:30600 (RA;US)
See Prohammer, L.A., 11:29432
Thomas, L.E., *See* Korenko, M.K., 11:30107
Thomas, S., *See* Maxon, H., 11:30695
Thomas, T. M., *See* Pitts, J. R., 11:29610
Thomas, W.D., *See* Crawley, H.B., 11:30467
Thomassen, K.I., Magnet alignment in MFTF-B, 11:31261 (BA;US)
Thompson, A.C., *See* Walton, J.T., 11:30430
Thompson, J., *See* Moffa, P., 11:31012
Thompson, J.D., *See* Reilly, J.K., 11:29832
Thompson, J.R., *See* Hacker, C.S., 11:30599
Thompson, M., *See* Efthimion, P., 11:31004
Thompson, M.A., *See* Day, A.C., 11:29529
Thompson, P.B., The Advanced Toroidal Facility (ATF), 11:31194 (J;US)
Thor, P., *See* Reiland, P., 11:29905
Thorbek, O., Disaggregating the service sector: survey results from Denmark, 11:29963 (RA;US)
Service-sector electricity consumption in Denmark, 11:29949 (RA;US)
Thornsness, C.B., *See* Stephens, D.R., 11:29172
Thron, J., *See* Dawson, J., 11:30448
Thunborg, S., Remote maintenance robot system for a pulsed nuclear reactor, 11:29822 (R;US)
Thurong, N., Possibilities and limits of community biogas plants in the frame work of biogas propagation strategy in Viet Nam, 11:29477 (RA;DE)
Tice, R.R., Cytogenetic analysis of bone marrow damage, 11:30649 (BA;US)
Tikoo, S.K., *See* Ahmad, M., 11:30820
Tillack, M., Identification and characterization of the key issues of fusion nuclear technology, 11:31245 (J;US)
Tilden, R., *See* Yoshida, R., 11:30458
Tillack, M., *See* Garner, J.K., 11:31152
Tillack, M.S., *See* Madrame, H., 11:31113
Tingle, A.G., *See* Higgins, J.C., 11:29803
Tiwari, S.N., *See* Chitsomboon, T., 11:30034
Todd, A.M.M., ICRF wave propagation and absorption in axisymmetric mirrors. Annual report, July 1, 1985-February 28, 1986, 11:30964 (R;US)
Todd, P.J., Molecular secondary ionization source for use with a high performance tandem mass spectrometer, 11:30277 (J;NL)
Tolan, J.S., *See* Shiao, S.Y., 11:30174
Tolk, K.M., *See* Sweeney, M.A., 11:31080
Tomkins, B.A., *See* Griest, W.H., 11:29185
Tomson, M.B., *See* Matty, J.M., 11:29636
Tonolli, J., *See* Mourgues, A., 11:29794
Toohey, R.E., Some measurements of the equilibrium factor for radon daughters in houses, 11:30556 (RA;US)
Torres, T.M., *See* Munson, D.E., 11:30751
Tortorelli, P.F., Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium, 11:31037 (RA;US)
Corrosion of type 316 stainless steel and 12 Cr-1 MoVW steel in flowing Pb-17 at. % Li, 11:31038 (RA;US)
Stress corrosion cracking of PCA - initial considerations and characterization of grain boundary precipitation, 11:31042 (RA;US)
See Braski, D.N., 11:30089
See Chopra, O.K., 11:31098
Toste, A.P., Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)
Toth, L.M., Reduction of plutonium(IV) using photochemically generated uranium(IV), 11:30313 (R;US)
Traeger, R.K., Sandia geothermal technology program: interactions with other DOE research and CSDP, 11:29910 (RA;US)
Trapp, T. J., *See* Cawley, W. E., 11:29755
Trask, B.J., *See* van den Engh, G.J., 11:30647
Trask, N.J., *See* Bredehoeft, J.D., 11:29401
Travis, J.R., *See* Osborne, M.F., 11:29855
Treat, R.L., Operational and long-term performance assessment for Hanford grout, 11:29379 (RA;US)
Treichel, I., *See* Deleens, E., 11:30677
Trester, P., *See* Cheng, E.T., 11:31241
Trevorrow, L.E., Greater-confinement disposal of radioactive wastes, 11:29337 (RA;US)
Trier, R.M., *See* Linsalata, P., 11:30619
Trifunac, A.D., Pulse radiolysis of cyclohexane: the identity of the high-mobility positive ion, 11:30304 (J;NL)
See Desrosiers, M.F., 11:30301
Triggs, T.J., Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2, 11:29792 (R;US)
Triolo, L., *See* Pinchera, G.C., 11:30527
Triolo, R., Small-angle neutron-scattering study of alkyl polyoxyethylene sulfate micelles. Effect of the number of polyoxyethylene groups on n-dodecyl polyoxyethylene sulfate in D_2O/H_2O mixtures at 25°C, 11:30263 (J;US)
Triplett, M.B., Simulation of the MRS receiving and handling facility, 11:29423 (BA;US)
Triscori, R., *See* Krigmont, H., 11:29707
Tristani-Kendra, M., *See* Bernstein, J., 11:30241
Trochon, J., Cold fragmentation in thermal neutron induced fission of ^{235}U, 11:30926 (R;FR)
Trowbridge, C.W., Low frequency electromagnetic field computation in three dimensions, 11:30329 (R;GB)
Troyer, R., High temperature calorimeter performance variable study, 11:30498 (R;US)
Trujillo, G., *See* Nyhan, J.W., 11:30618
Trumble, D., *See* Goeltz, R., 11:30015
Trumble, T.M., Testing of gallium arsenide solar cells on the CRRES vehicle, 11:29539 (RA;US)
Truran, J.W., *See* Starrfield, S., 11:30785
Tsai, C.C., *See* Dagenhart, W.K., 11:31200
See Hoffman, D.J., 11:31191
See Schechter, D.E., 11:31233
See Whealton, J.H., 11:31010
Tsang, W., Thermodynamic and kinetic properties of the cyclohexadienyl radical, 11:30243 (J;US)
Tschalaer, C., *See* Brown, R.D., 11:30099
Tsokos, K., *See* Berger, E.L., 11:30878
Tsou, S.T., *See* Chan, H.M., 11:30885, 11:30886
Tucker, T.J., *See* Cowan, M., 11:30352
Tully, F.P., Hydrogen-atom abstraction from alkanes by OH. 2. Ethane, 11:30251 (J;US)
Tunkel, J.L., Formation of benzene by the pyrolysis of 4-vinylcyclohexene regiospecific formation of anthracenes in the pyrolysis of dibenzosuberones and related systems, 11:30271 (D;US)
Tuominen, A., Heat pumps for district heating of smaller cities, 11:30024 (R;FI;In Finnish)
Turian, R.M., Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)
Turiel, I., Analysis of energy conservation standards for Singapore office buildings, 11:29978 (RA;US)
Analysis of energy conservation standards for Singapore office buildings, 11:30020 (J;GB)
Turner, D., *See* Graves, K., 11:30551
Turner, K.J., *See* Drake, G., 11:30447
Turner, L.R., The Felix experiments: measurements of electromagnetic effects, 11:31164 (J;US)
Turner, M.S., Bianchi models and new inflation, 11:30766 (R;US)
Probing the structure of the galactic halo with gamma rays produced by WIMP annihilations, 11:30764 (R;US)
Turner, T.F., *See* Place, B.G., 11:29281
Turner, W.C., Summary abstract: control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment, 11:31259 (J;US)
Turney, J., *See* Leventhal, L., 11:29354
Turney, J.H., *See* Best, W.T., 11:29389
Turunen, R., Exhaust gas analysis of a diesel engine using alcohol as a fuel, 11:30040 (R;FI;In Finnish)
Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines, 11:30037 (R;FI;In Finnish)
Tuttle, M.L., An evaluation of the effects of weathering on a 50-year old retorted oil-shale waste pile, Rulison Experimental Retort, Colorado, 11:29287 (BA;US)
Tuunanen, P., Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study, 11:29999 (R;FI;In Finnish)
Tye, R.P., *See* McElroy, D.L., 11:30021
Tyron-Hopko, A., *See* McClure, J.D., 11:29305
Tzanos, C.P., Model for LMFBR core transient analysis in real-time, 11:29779 (R;US)
Tzeng, G.H., Commercial sector energy consumption in Taiwan, R.O.C., 11:29958 (RA;US)

U

Uckan, N.A., *See* Santoro, R.T., 11:31180
See Uckan, T., 11:31181
Uckan, T., Assessment of magnetic field asymmetries in ELMO Bumpy Square, 11:31181 (J;US)
Uden, C.N., *See* Apsimon, R.J., 11:30450
Uegaki, J., *See* Levy, C.D.P., 11:30416
Uetake, Naohito, Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
Ullah, M.B., Climate of Riyadh and the passive response in traditional buildings, 11:30010 (RA;US)
Studies of froosh, the thermoregulating indigenous construction material of the Saudi Arabian Gulf Coast, 11:29579 (RA;US)
Uncapher, W.L., *See* Madsen, M.M., 11:30350
Unger, H., Liquefied gases risk assessment. Part 1: LPG land transportation and storage safety. Part 2: Potential hazards of low-temperature LPG in contact with warmer liquids, e.g. water, 11:29243 (R;DE;In German)
Unkefer, C.J., In vivo studies of pyridine nucleotide metabolism in Escherichia coli and Saccharomyces cerevisiae by carbon-13 NMR spectroscopy, 11:30655 (J;US)
Unrah, W.P., *See* Baird, W., 11:30433
Upschulte, B.L., Chemiluminescence of CS_2^+ initiated by a thermal energy charge-transfer reaction with Ar^+, 11:30212 (J;US)
Uribe, F.S., *See* Musket, R.G., 11:30113
Urland, C.S., *See* Negin, C.A., 11:29395
Urtiew, P.A., *See* Westbrook, C.K., 11:29488

V

Vahala, G., *See* Vahala, L., 11:30991
Vahala, L., Effects of alpha particles on the scattering function in CO_2 laser scattering, 11:30991 (J;AT)
Valentine, R.E., *See* Sparks, L.E., 11:29733
Valentini, J.J., Reactive and inelastic energy transfer in $H+D_2$ collisions studied by single-collision CARS spectroscopy, 11:30819 (B;US)
Valeo, E., *See* Clark, C.W., 11:30365
Valeo, E.J., Numerical modeling of lower hybrid heating and current drive, 11:30979 (R;US)
Van Berg, R., *See* Drake, G., 11:30468
van Brakel, G.H., *See* Kispert, L.D., 11:30272
Van Craeynest, J.C., *See* Bordes, P., 11:29758
van den Engh, G.J., Preparation and bivariate analysis of suspensions of human chromosomes, 11:30647 (J;US)
Van der Molen, S.B., *See* De Boer, T.C., 11:29836
Van Devender, J.P., Status of PBFA II for Inertial Confinement Fusion with light ions, 11:31218 (J;US)
Van Hare, D.R., Fiber optic modification of a diode array spectrophotometer, 11:30496 (R;US)
Van Hine, C., *See* Jones, E.R. Jr., 11:30219
Van Hoesen, S.D., *See* Bates, L.D., 11:29341
Van Sicien, C.D., *See* Caffrey, A.J., 11:30472
Van Voris, P., *See* Thomas, J.M., 11:30600
Vandecasteele, C., Certification of carbon and nitrogen in molybdenum (BCR No. 23), 11:30178 (R;FR)
Vandegrift, G.F., Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Vander Jagt, D.L., *See* Silverman, I.R., 11:30259
Vanderborck, Y., *See* Nieuwland, H.C.D., 11:30094
Vansteelandt, G., Electricity consumption in Belgium's service sector, 11:29956 (RA;US)
Variano, B.F., Effect of high pressure on critical concentration energy transport in isotopically mixed naphthalene crystals, 11:30255 (J;US)
Varma, A.K., Evaluation of the expected uncertainty in precipitation scavenging rates for effluents resulting from a nuclear reactor accident, 11:30562 (RA;US)
See Lewellan, W.S., 11:30561
Varughese, D., *See* Matty, J.M., 11:29636
Vaughen, V.C.A., Science, technology, and society, 11:30735 (R;US)
Vaught, D.L., Project management of radwaste retrofits, 11:29810 (RA;US)
Vayonakis, C.E., *See* McDonald, J., 11:30859
Venkataraman, R., Canonical ensemble redefined - 2: Magnetic systems, 11:30957 (R;XA)
Venturini, E.L., *See* Emge, T.J., 11:30245
Verdier, R., *See* Johnson, A.S., 11:30477
Vergino, E.S., Discrimination of NTS explosions and western United States earthquakes: data processing, 11:30518 (R;US)
Vertes, A., Enhancement of neutralization reaction in colloidal ferric hydrous oxide, 11:30305 (J;GB)
Verwaerde, D., *See* Daronian, P., 11:30945
Vest, R.W., Ink jet printing of silver metallization for photovoltaics. Quarterly technical report, January 1-March 31, 1986, 11:29505 (R;US)
Veteau, J.M., *See* Deruaz, R., 11:29837
Vetrovec, J., Calculating the pumping speed of cryopanels: option to Monte Carlo methods, 11:31250 (J;US)
Design of vacuum systems for MFTF-B neutral beamlines, 11:31205 (J;US)
See Weeds, J., 11:31206
Vianna, D.M., *See* Barros, S. de, 11:30928
Vikis, A.C., Photochemical method for radioiodine abatement, 11:29311 (R;CA)
Villaprino, R., *See* Basso, M., 11:29594
Villeret, O., Variations of dose distribution in high energy electron beams as a function of geometrical parameters of irradiation. Application to computer calculation, 11:30664 (R;FR;In French)
Vincenti, J.R., Penn State continuing education program on low-level radioactive waste disposal and management: lessons learned, 11:29318 (RA;US)
Viner, A.S., Microcomputer models for particulate control, 11:29691 (RA;US)
Virshup, G.F., *See* Werthen, J.G., 11:29521
Vitagliano, V., *See* Miller, D.G., 11:30198, 11:30200
Vitek, J.M., *See* Corwin, W.R., 11:31061
See Klueh, R.L., 11:30080, 11:31063
Vo-Dinh, T., Luminescence of 1,4-naphthoquinone and the vitamin K system in Shpolskii matrices at 4 K, 11:30275 (J;GB)
Voetberg, G., *See* Stewart, C.R., 11:30675
Vogelsang, W.F., *See* Hoffman, N.J., 11:31221
Voigtman, E., Low-pass filters for signal averaging, 11:30399 (J;US)
Vold, E.L., *See* Abdou, M.A., 11:31086
Volodzko, M., *See* McGrath, R.N., 11:29347
von Courbiere, R., Requirements for EV-batteries and consequences for test procedures, 11:30050 (RA;US)
Von der Hardt, P., *See* Chrysochoides, N.G., 11:29820
von Frese, R.R.B., *See* Hinze, W.J., 11:29622
Von Halle, A., *See* Williams, M.D., 11:31198
Vonrosenvinge, T.T., *See* Mason, G.M., 11:30786
Voss, E., Testing of batteries in Germany, 11:29881 (RA;US)
Vries, O. de, Aerodynamic research on wind turbines at NLR, 11:29661 (RA;DE)
Vuorinen, I., *See* Lietzen, E., 11:29681

W

Waast, B., *See* Bretonneau, P., 11:30408
Wada, M., In-test and post-test analyses of sodium-sulfur cells, 11:29899 (RA;US)
Wade, R., *See* Hawarden, T.G., 11:30792
Wadlinger, E.A., RFQ scaling-law implications and examples, 11:30413 (R;US)
Waechter, D.A., *See* Gutschick, V.P., 11:30505
Waggett, G.G., *See* Matty, J.M., 11:29636
Waggett, P.W., *See* Harrison, R.A., 11:30789
Wagner, C., *See* Cohn, D.R., 11:31173
Wagner, D.I.U., Design, electric vehicle simulation program and duty cycle for a computer controlled bench test of lead-acid batteries, 11:30057 (RA;US)
Wagner, M., Superlattices and multilayer structures for high efficiency solar cells, 11:29526 (RA;US)
Wagner, R., *See* Yarema, R.J., 11:30471
Wagner, R.G., *See* Drake, G., 11:30468
Wagner, R.S., Picosecond photoconductors as radiation detectors, 11:30427 (J;US)
Wait, G.D., TRIUMF polarized deuteron target NMR system, 11:30417 (R;CA)
Wakuta, Yoshihisa, *See* Hasuyama, Hiroki, 11:30974
Wald, S., *See* Schmidt, H.R., 11:30482
Waldheim, L., *See* Sinclair, A., 11:29153

Walker, D.C., Factors influencing boiler efficiency, 11:29995 (R;GB)
Walker, E.B., Characterization of subsets of bone marrow-derived macrophages by flow cytometry analysis, 11:30646 (J;US)
Walker, J.S., MHD flow control as a design approach for self-cooled liquid-metal blankets of magnetic confinement fusion reactors, 11:31112 (J;US)
Walker, J.T., *See* Haller, G.M., 11:30457
Walker, T.E., Synthesis of oxygen-18 enriched phenol and naphthol from $^{18}O_2$, 11:30278 (J;GB)
Walker, T.G., SERC support for research in wind energy, 11:29648 (RA;GB)
Walko, R. J., *See* Bacon, F. M., 11:30668
Wallenberg, B., Utility perspective on commercial sector markets, 11:29970 (RA;US)
Walsh, R.G., *See* Sutherland, R.J., 11:29907
Walther, G., *See* Schmid-Haas, P., 11:30714
Walton, J.T., 300-element silicon-lithium position-sensitive imaging detector for angiography, 11:30430 (J;US)
Walton, O. R., *See* Mallon, R. G., 11:29265
Walton, O.R., *See* Pitts, J.H., 11:31159
Walton, R.B., *See* Yates, G.J., 11:30494
Walz, H.V., FASTBUS review 1985, 11:30435 (J;US)
Wambach, J., Spin excitations in ^{208}Pb, 11:30923 (BA;US)
Wang, H., *See* Toohey, R.E., 11:30556
Wang, H.H., *See* Emge, T.J., 11:30245
Wang, H.P., *See* Liang, J., 11:30214
Wang, J., *See* Freytag, D.R., 11:30444
Wang Zhiren, *See* Qian Zeshu, 11:29469
Ward, M., Infrared emission from active nuclei, 11:30799 (RA;GB)
Ward, S.H., *See* Wright, P.M., 11:29621
Ward, T.J., *See* Armstrong, D.W., 11:30260
Warfield, K., *See* Dubois, R., 11:30455
Warmack, R.J., *See* Bloemer, M.J., 11:30393
Warner, N.L., *See* Walker, E.B., 11:30646
Warniez, P., Analysis of maintenance and quality assurance measures for the different radioactive materials packagings in the member states of the European Community, 11:30338 (R;FR;In French)
Warpinski, N.R., Elastic and viscoelastic model of the stress history of sedimentary rocks, 11:30754 (R;US)
Warren, K., *See* Boercker, D.B., 11:30983
Washizu, M., *See* Kahn, C., 11:30989
Wassef, W.A., *See* Nagy, M.E., 11:30944
Waters, G., *See* Wait, G.D., 11:30417
Waters, J.W., Microwave limb sounder for stratospheric measurements, 11:30181 (R;US)
Watkins, J.W. II, *See* Elder, R.C., 11:30254
Watrous, J.J., Estimates of maximum trappable ion beam power in plasma channels, 11:30982 (R;US)
Watson, J., *See* McCourt, P., 11:30630
Watson, N.D., Earth Radiation Budget Experiment (ERBE) scanner instrument anomaly investigation, 11:30426 (R;US)
Watson, R.D., *See* Brown, G.W., 11:31251
See Smith, M.F., 11:31238
Watson, R.L., *See* Saluja, P.P.S., 11:29312
Watt, R.C., *See* Smith, S.A., 11:30639
Watt, R.G., *See* Massey, R.S., 11:31177
Watterberg, P.A., *See* Pepper, D.W., 11:30378
Watts, K.D., *See* Snyder, A.M., 11:31108
Watts, R.J., *See* Ma, M.S., 11:29323
Wawersik, W.R., Experience with hydraulic fracturing tests for stress measurements in the WIPP, 11:30753 (R;US)
Wayman, C.M., *See* Erck, R.A., 11:30083
Weatherby, D.R., *See* Sunderman, F.W. Jr., 11:30654
Webb, S.W., Coupling of aerosol removal mechanisms in rising bubbles, 11:29813 (R;US)
Webber, D.M., Factors influencing pool fires on porous ground, 11:30544 (R;GB)
Weber, B.V., *See* Boller, J.R., 11:31265
Weber, P.G., *See* Massey, R.S., 11:31177
Weber, W.J., Effects of alpha irradiation on barium hollandite and nickel-iron spinel, 11:30306 (J;US)
Webster, C.S., *See* Osborne, M.F., 11:29855
Wechsler, M.S., *See* Brown, R.D., 11:30099
Weech, M.E., *See* Dillmann, C.W., 11:29355
Weeds, J., Active beam dump module design for MFTF-B, 11:31206 (J;US)
Weeren, H.O., Recent hydrofracture operations at Oak Ridge National Laboratory, 11:29374 (RA;US)
Wegner, C.R., *See* Baumbaugh, A.E., 11:30469
Wehring, B.W., *See* Hertel N.E., 11:31091
Wehrle, R.B., *See* Turner, L.R., 11:31164
Wei, G. C., Silicon carbide whisker reinforced ceramic composites and method for making same, 11:30126 (P;US)
Weimer, W.C., *See* Wright, C.W., 11:30725
Weinberg, I., Radiation damage in high-resistivity silicon solar cells, 11:29532 (RA;US)
Weinberg, I.N., *See* Hoffman, E.J., 11:30439
Weinzierl, K., Combined cycle process with integrated gasification VEW-Coal Conversion Process, 11:29679 (R;SE)
Weirick, L.J., *See* Westrich, H.R., 11:29639
Weiss, E.S., Dust and pressure generated during commercial oil shale mine blasting, 11:29260 (BA;US)
Weiss, R.L., *See* Delegard, C.H., 11:30616
Welt, F. L., Process for preparing 2,3 dihydroxybenzoic acid amides of tetraaraalkanes and cycloalkanes, 11:29242 (P;US)
Welzer, V.G., Gallium arsenide solar cell efficiency: problems and potential, 11:29519 (RA;US)
Welch, D.R., Analysis of doublet proton spectra from laser implosion experiments, 11:31256 (J;US)
Welch, J.J., Low energy cyclotron for radiocarbon dating, 11:30410 (R;US)
Welland, H.J., *See* Masson, L.S., 11:31114
Weller, R.E., *See* Yates, R.W., 11:30673
Wendel, M.W., *See* Giles, G.E., 11:30328
Wendt, J.P., *See* Janousek, B.K., 11:29540
Werme, L.O., Scientific basis for nuclear waste management IX, 11:29420 (B;US)
Werner, H., *See* Teuchert, E., 11:29775
Werner, J., *See* Breunlich, W.H., 11:31077
Werner, K., *See* Dietrich, K., 11:30931
Werner, M.L., Evaluation of the structure and stratigraphy over Richton Dome, Mississippi, 11:30738 (R;US)
Werner, M.W., *See* Lester, D.F., 11:30784
Wersinger, J.M., *See* Swanson, D.G., 11:30965
Werthen, J.G., High-efficiency AlGaAs-GaAs Cassegrainian concentrator cells, 11:29521 (RA;US)
West, C.D., Stirling machines: adiabatic to isothermal, 11:30048 (R;US)
West, W.P., Cw dye laser system for Li beam spectroscopy in a tokamak, 11:30972 (R;US)
Plasma density and poloidal field measurements on text using an injected lithium beam, 11:30971 (R;US)
See Thomas, D.M., 11:31014
Westbrook, C.K., Chemical kinetics of propane oxidation in gaseous detonations, 11:29488 (J;US)
Chemical kinetics of hydrocarbon oxidation in gaseous detonations, 11:29489 (J;US)
Westbrook, R.D., *See* Ruckteschler, R., 11:29557
Westholm, F.A., *See* Short, M.T., 11:30635
Weston, L.K., *See* Daub, G.J., 11:29258
Westrich, H.R., FY 1984 and FY 1985 geochemistry and materials studies in support of the Magma Energy Extraction Program, 11:29639 (R;US)
Wetzstein, H.Y., *See* Lee, N., 11:30679
Weulersse, J.M., *See* Clerc, M., 11:29290
Whangbo, M.H., *See* Emge, T.J., 11:30245
Wharton, J., Overview of electricity use in the United States service sector, 11:29960 (RA;US)
Whealton, J.H., Theory of feedthroughs: wave transmission and voltage characteristics of high-power current feeds for ICRH, 11:31199 (J;US)
Theory of the plasma edge: recycling sheaths, 11:31010 (BA;US)
See Dagenhart, W.K., 11:31200
See Owens, T.L., 11:31192
Wheeler, M.L., *See* Nyhan, J.W., 11:30618
Whetten, J.T., Geothermal activities in Central America, 11:29981 (RA;US)
Whitaker, C.M., Photovoltaic array thermal behavior, 11:29562 (BA;US)
Whitbeck, J.F., *See* Bliem, C.J., 11:29913
White, J.C., Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation, 11:29277 (BA;US)
White, L.W., *See* Rye, P.B., 11:29266
White, R.K., *See* Mokler, B.V., 11:30554
Whitley, J.B., *See* Koski, J.A., 11:31081
See Smith, M.F., 11:31238
Whitley, R.H., *See* Moir, R.W., 11:31143
Whitman, G.D., Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research, 11:29859 (R;US)
See Bryan, R.H., 11:29796
Whitney, D.M., *See* Stewart, M.E., 11:30984
Whitten, D.G., *See* Lee, L.Y.C., 11:30288

Whittle, D.P., *See* Yang, F.C., 11:30117
Wickham, L.E., DOE approach to threshold quantities, 11:29332 (RA;US)
Widrow, L., *See* Turner, M.S., 11:30766
Wieber, P.R., *See* Martin, J.W., 11:29170
Wieling, N., Research on erosion and corrosion of cobalt-free materials, 11:30093 (R;FR;In German)
Wiemers, K.D., *See* Scheele, R.D., 11:29425
Wienke, B.R., Parallel S /sub n/ iteration schemes, 11:30950 (J;US)
Wiernicki, C., Ultrasound: biological effects and industrial hygiene concerns, 11:30731 (J;US)
Wiffen, F.W., *See* Davis, J.W., 11:31100
See Gohar, Y., 11:31135
Wiggins, D.J., *See* Nishimoto, D.D., 11:29334
Wiggins, J.T., *See* Knauer, J.B., 11:30336
Wignall, G.D., *See* Sperling, L.H., 11:30146
Wilbourn, R.G., Development of a grout-based stabilization method for spent high-temperature gas-cooled reactor fuel, 11:29380 (RA;US)
Wilbur, C.K., *See* Vandegrift, G.F., 11:30586
Wilcox, B.A., Integration of passive and active solar strategies in buildings, 11:29568 (RA;US)
Wild, J.F., *See* Roberts, R.A., 11:30311
Wild, U.P., *See* Vo-Dinh, T., 11:30275
Wilder, D.G., Inelastic deformations of fault and shear zones in granitic rock, 11:30757 (R;US)
Wilemski, G., The role of heat transfer in molten carbonate fuel cell performance, 11:29987 (B;US)
Wiley, C.L., *See* Peterson, N.L., 11:30139, 11:30230
Wilhm, J.L., *See* Nelson, D.J., 11:30607
Williams, H.H., *See* Drake, G., 11:30468
Williams, J.E.C., *See* Cohn, D.R., 11:31173
See Yang, T.F., 11:31172
Williams, J.M., *See* Bruno, J.W., 11:30318
See Emge, T.J., 11:30245
Williams, J.R., Performance and cost experience of active solar-heated buildings, 11:29571 (RA;US)
Williams, L. S., *See* Grover, J. M., 11:29782
Williams, M.D., Neutral beam heating system for TFTR, 11:31198 (J;US)
Williams, M.L., Computational methodology for the Oak Ridge Research Reactor (ORR) and Bulk Shielding Reactor (BSR): the VICTORR input processing code for the BOLD VENTURE system. Volume 2, 11:29821 (R;US)
Williams, P.E., Structure and uranium deposits of the Salina Quadrangle, Utah, 11:29288 (R;US)
Williams, R.E., Development and use of a remote waste handling system for disposal of greater confinement wastes, 11:29327 (RA;US)
Williams, S., *See* Bird, F., 11:30478
Williamson, J., *See* Hannifan, M., 11:29593
Williamson, J.S., Overview of US solar building research, 11:29575 (RA;US)
Williamson, R.B., *See* Dod, R.L., 11:30537
Williford, R.E., Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)
Willms, H., *See* Adomeit, G., 11:30323
Wilson, D., *See* Kiel, D., 11:30002
Wilson, J.A., *See* Rykken, L.E., 11:29396
Wilson, K., *See* Meot-Ner , M., 11:30258
Wilson, M.J., *See* Gordon, L.B., 11:29564
Wilson, R.R., R and D needs in wind energy - the manufacturers view, 11:29645 (RA;GB)
Windt, D., *See* Scott, M.L., 11:30341
Winefordner, J.D., *See* Voigtman, E., 11:30399
Wingerden, G.J.M.v., On the adequacy of numerical codes for the simulation of vapour cloud explosions. Pt. 1, 11:30508 (R;FR)
Winkler, L., Guide to sharing personal computer resources via local area networks, 11:31277 (R;US)
Winograd, L.J., *See* Bredehoeft, J.D., 11:29401
Winters, W.S., *See* Faas, S.E., 11:29609
Wirtenson, G.R., Coatings for high energy applications. The Nova laser, 11:31083 (R;US)
Wiscombe, W.J., Single scattering from nonspherical Chebyshev particles: a compendium of calculations, 11:30888 (R;US)
Wise, J.F., Future Air Force space power needs, 11:29560 (RA;US)
Wismontski-Knittel, T., Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies, 11:30276 (J;US)
Witherspoon, J.P., *See* Taylor, F.G., 11:30587
Witkamp, M., External factors influencing mineralization and immobilization of some radionuclides from tree litter, 11:30576 (BA;XA)
Loss of weight, ^{60}Co, and ^{137}Cs from tree litter in three subsystems of a watershed, 11:30588 (J;US)
See Crossley, D.A. Jr., 11:30703
Witt, R., *See* Cohn, D.R., 11:31173
Wittenberg, L.J., *See* Sviatoslavsky, I.N., 11:31151
Wittig, C., *See* Chou, J.S., 11:30300
Wofsy, C., Effect of preferential insertion of LDL receptors near coated pits, 11:30636 (J;US)
Wojtowicz, D., The role of fusion reaction products in the stability of EBT reactors, 11:31167 (J;US)
Wojtowicz, M., *See* Calo, J.M., 11:29160
Wolf, H., *See* Barros, S. de, 11:30928
Wolf, M.A., *See* Gutschick, V.P., 11:30505
Wolf, R.B., *See* Strojan, C.L., 11:30569, 11:30570, 11:30760
Wolf, S.H., *See* Skinner, M.F., 11:29730
Wolf, T.L., *See* Wilemski, G., 11:29987
Wolfer, W.G., An assessment of radiation effects in beryllium, 11:31249 (J;US)
Wolk, R.H., *See* Alpert, S.B., 11:29680
Wollenberg, H.A., *See* Sorey, M.L., 11:30747
Wong, C., Measurements and calculations of the leakage multiplication from hollow beryllium spheres, 11:31154 (J;US)
Wong, C.P.C., *See* Cheng, E.T., 11:31241
See Sze, D.K., 11:31096
Wong R.F., Helium-cooled blanket designs, 11:31104 (J;US)
Wood, D.R., *See* Kirsten, F.A., 11:30470
See Skinner, G.B., 11:30322
Wood, D.S., *See* Nieuwland, H.C.D., 11:30094
Wood, J.C., *See* Sekar, R.R., 11:30045
Wood, M.T., General design of a technical assistance program to help DOE/ prime contractor buyers in doing business with small disadvantaged businesses, 11:31272 (R;US)
Wood, O.R.,II, *See* Silfvast, W.T., 11:30372
Wood, P.A., Fundamentals of bulk solids flow, 11:29211 (R;GB)
Wood, R.F., *See* Ruckteschler, R., 11:29557
Woodis, A., Department of Energy extended burnup data base. Final report, 11:29749 (R;US)
Woodruff, W.H., *See* Morris, D.E., 11:30815
Woods, J.W., *See* Conlin, J.A., 11:31052
Woody, C.L., Properties of a barium fluoride-TMAE-multiwire proportional chamber detector using a large single crystal, 11:30451 (J;US)
Worley, B.A., Version of ORIGEN2 with automated sensitivity-calculation capability, 11:29398 (R;US)
Worsham, J.R., *See* Pettus, W.G., 11:29760
Wrasman, B.P., *See* Whitaker, C.M., 11:29562
Wright, B.W., *See* Yonker, C.R., 11:30182
Wright, C.W., Chromatographic chemical characterization of solvent refined coal I and II, 11:30725 (J;DE)
Wright, J., *See* Wood, M.T., 11:31272
Wright, P.M., Borehole geophysical techniques for defining permeable zones in geothermal systems, 11:29621 (RA;US)
Wright, R.A., *See* Niemeyer, J.W., 11:29710
Wright, R.Q., *See* Pin, F.G., 11:30741
See Worley, B.A., 11:29398
Wrobel, J.R., *See* Gagliardi, C., 11:30904
Wrobleski, D.A., Preparation and characterization of the first organoactinide polysulfide (eta^5-$C_5Me_5)_2ThS_5$. A unique example of the twist-boat conformation of the MS_5 ring, 11:30319 (J;US)
See Hay, P.J., 11:30316
Wu, Y.S., Multiple-porosity method for simulation of naturally fractured petroleum reservoirs, 11:29235 (R;US)
Wuest, E., Microscopic study of the S band in the generator co-ordinate approach, 11:30918 (R;XA)
Wulff, W., Plant analyzer development for high-speed interactive simulation of BWR plant transients, 11:29828 (R;US)
Wyatt, J.F., Identification of highly-ionized xenon spectra (Xe XXVI through Xe XXXI) excited in the plasma of the TFR Tokamak, 11:30966 (R;FR)

Y

Yabe, T., *See* Mochizuki, T., 11:30374
Yamaguchi, G.T., *See* Thomassen, K.I., 11:31261

Yamaguchi, Yoshio, Reflection of the classical age in the intermediate energy physics, 11:30934 (R;JP)
Unified theory of nuclear physics, 11:30935 (R;JP)
Yamamoto, Nobuo, Grand unification mass scale and proton life time in SO(10) model, 11:30883 (RA;JP)
Yamanaka, C., *See* Mochizuki, T., 11:30374
Yamazaki, Nakamichi, *See* Nishihara, Yukoi, 11:29346
Yanagida, T., Composite quasi Nambu-Goldstone fermions, 11:30869 (RA;JP)
Yancik, J., Coal: evolving supply and demand in world seaborne steam coal trade, 11:29225 (R;US)
Yang, B.L., *See* Hong, F., 11:30229
Yang, D.C., Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Yang, F.C., Sulfur diffusion in oxide grain boundaries, 11:30117 (J;GB)
Yang, R.T., *See* Cen, P., 11:30183
Yang, S., TFCX shielding optimization, 11:31149 (J;US)
See Gohar, Y., 11:31135
Yang, S.-T., *See* Gohar, Y., 11:31094
Yang, T.F., A demountable toroidal field coil system for a commercial tokamak reactor, 11:31172 (J;US)
See Le Claire, R.J., 11:31165
Yarema, R.J., A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers, 11:30471 (J;US)
Yasuda, T., Brief review on neutrino mass measurements, 11:30833 (RA;JP)
Yasue, Masaki, *See* Takeshita, Seiichiro, 11:30864
Yasumi, Shinjiro, Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho, 11:30827 (RA;JP)
Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho, 11:30834 (RA;JP)
Yasutake, K.M., *See* Schneider, K.J., 11:29412
Yates, G.J., Radiation effects on video imagers, 11:30494 (J;US)
Yates, R.W., Myeloproliferative disease in a cat, 11:30673 (J;US)
Yde, C., Ural-Tweed bighorn sheep - wildlife mitigation project. Annual report, 1 September 1984-31 December 1985, 11:30590 (R;US)
Yee, J.H., *See* Khanaka, G.H., 11:30331
Yeh, Y.C.M., Experience with OMCVD production of GaAs solar cells, 11:29528 (RA;US)
Yelton, W.G., Control of precious metal plating baths using electrogravimetric analysis, 11:30330 (R;US)
Yesavage, V.F., Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
Yonker, C.R., Temperature dependence of retention in supercritical fluid chromatography, 11:30182 (J;US)
Yoon, R., *See* McCreary, T.W., 11:30238
Yorke, H.W., On the origin of extragalactic infrared radiation, 11:30791 (RA;GB)
Yoshida, R., Tetrode photomultiplier base for high magnetic field environments, 11:30458 (J;US)
Yoshida, Tadashi, *See* Katakura, Jun-ichi, 11:30913
Yoshikawa, S., Pressure limits of an axisymmetric torus, 11:30981 (R;US)
Yoshioka, M., *See* Hirabayashi, H., 11:30831
Young, C.C., Performance of the SLD Central Drift Chamber prototype, 11:30476 (J;US)
Young, E.F. Jr., Impact of coming particulate control requirements on the iron and steel industry, 11:30566 (RA;US)
Young, F.C., Comparison of diode voltage and ion energy for an intense pulsed ion-beam diode, 11:31268 (BA;US)
Young, F.W. Jr., *See* Kerchner, H.R., 11:29818
Young, J.P., Chemical and physical consequences of α and β^- decay in the solid state, 11:29426 (J;US)
See Donohue, D.L., 11:30188
Young, K.M., *See* Kilpatrick, S.J., 11:30980
Young, M.A., *See* Zimmerman, D.A., 11:30604
Young, R.P., Onset of electrical breakdown in dust layers, 11:29720 (RA;US)
Young, S., *See* Moffa, P., 11:31012
Youngdahl, C.A., Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)
Youssef, M., Analysis and intercomparison of Phase I experiments at FNS. Article 9, 11:31033 (R;US)
See Garner, J.K., 11:31152
Youssef, M.Z., Status of methods, codes and applications for sensitivity and uncertainty analysis, 11:31125 (J;US)
Uncertainties in prediction of tritium breeding in candidate blanket designs due to present uncertainties in nuclear data base, 11:31087 (J;US)
US/JAERI calculational benchmarks for nuclear data and codes intercomparison. Article 8, 11:31032 (R;US)
See Abdou, M.A., 11:31086
See Oyama, Y., 11:31243
See Shin, K., 11:31156
Yu, C., *See* Trevorrow, L.E., 11:29337
Yu, J., Interstitial dislocation loop nucleation and growth and swelling produced by high-energy cascades, 11:31075 (R;US)
Yu, L.C., *See* van den Engh, G.J., 11:30647
Yu, L.H., Transverse correlations in start-up of a free electron laser from noise, 11:30361 (R;US)
Yu Xiue, *See* Qian Zeshu, 11:29469
Yule, T.J., *See* Bennett, E.F., 11:31157
Yung, S., Hot spots in the inboard section of the TFCX toroidal field coils, 11:31183 (J;US)
Yung, S.C., *See* Duncan, M.W., 11:30529
Yusa, Hideo, *See* Uetake, Naohito, 11:30153
Yuusef, M., *See* Deis, G.A., 11:31247

Z

Zabel, H., *See* Fischer, R., 11:30165
Zachman, K.L., *See* Coutant, C.C., 11:30702
Zaharia, O., *See* Sunderman, F.W. Jr., 11:30729
Zahn, G.R., *See* Lue, J.W., 11:31171
Zaki, G.M., *See* El-Genk, M.S., 11:29864
Zalkin, A., *See* Edwards, P.G., 11:30273
Zammite, R., French study and research program on water cooled reactor safety, 11:29757 (R;FR;In French)
Zardecki, A., Diffusion approximation for modeling of 3-D radiation distributions, 11:30948 (R;US)
Zax, D.B., Zero-field NMR of solid bis(μ-hydrido)decacarbonyltriosmium, 11:30203 (J;US)
Zeevaart, J.A.D., *See* Cornish, K., 11:30678
See Creelman, R.A., 11:30682
Zeiger, E., Stomatal limitation to carbon gain in Paphiopedilum sp. (Orchidaceae) and its reversal by blue light, 11:30680 (J;US)
See Assmann, S.M., 11:30681
Zeman, H.D., *See* Walton, J.T., 11:30430
Zhang, Q.L., Reactivity of large carbon clusters: spheroidal carbon shells and their possible relevance to the formation and morphology of soot, 11:30248 (J;US)
Zhang, S.Y., Comparison of the domain and frequency domain state feedbacks, 11:30392 (R;US)
Zero models and pole models for multivariable systems, 11:30960 (R;US)
Zhou, S.H., *See* Cable, M.D., 11:30907
Zhou, Z.Y., *See* Cable, M.D., 11:30907
Zhou Dazhuang, *See* Dwyer, R., 11:30484
Zhu, Y., *See* Dubois, R., 11:30455
Zichy, J.A., *See* Lue, J.W., 11:31171
Zigelman, D.A., Volume reduction of dry active waste: the mobile service option, 11:29383 (RA;US)
Zilm, K.W., Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985, 11:29177 (R;US)
Zimmer, A., *See* Madsen, M.M., 11:30350
Zimmer, R.A., *See* Rosbury, K.D., 11:29201
Zimmer, W., *See* Guber, W., 11:29356
Zimmerman, D.A., Hanford site water table changes 1950-1980: data observations and evaluation, 11:30604 (R;US)
Zimmerman, P., *See* Waters, J.W., 11:30181
Zimmerman, R.D., *See* Wilbourn, R.G., 11:29380
Zimmerman, R.E., *See* Lanza, R.C., 11:30666
Zimmerman, R.M., Expected thermal and hydrothermal environments for waste emplacement holes based on G-tunnel heater experiments, 11:30749 (R;US)
Zimmerman, S., A FASTBUS logic analyzer based on SLAC SNOOP diagnostic modules, 11:30464 (J;US)
See Haldeman, M., 11:30465
Zimmerman, T., *See* Yarema, R.J., 11:30471

Zimmermann, C., Sealing biogas plants with flexible plastic covers. Experiences gained with a German digester, 11:29478 (RA;DE)
Zinder, S.H., Non-aceticlastic methanogenesis from acetate: acetate oxidation by a thermophilic syntrophic coculture, 11:29487 (J;DE)
Zinnecker, H., Near infrared study of Virgo dwarf ellipticals, 11:30795 (RA;GB)
Ziolkowski, R.W., *See* Deschamps, G.A., 11:30959
Ziph, B., Experimental assessment of advanced Stirling component concepts, 11:30049 (R;US)
Zmeskal, J., *See* Breunlich, W.H., 11:31077
Zucker, C.L., *See* Haase, C.S., 11:29375
Zucker, H., *See* Meiringer, G., 11:30718
Zunger, A., *See* Martins, J.L., 11:30169
Zweben, S.J., *See* Cecil, F.E., 11:30978

SUBJECT INDEX

The subject index is based on the use of subject descriptors selected from a controlled thesaurus of terms (DOE/TIC-7000). Subject descriptors and qualifiers (subheadings) are selected and presented in the following format:

SUBJECT DESCRIPTOR
Qualifier
Title, (supplementary information), citation number, (R;US)

The notations in the final parentheses indicate the type of document, e.g., R for Report; the country of publication, e.g., US; and the language if other than English, e.g., In German. Tables of document types and country of publication codes appear after the indexes.

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processes applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept (e.g., Pipeline Quality Gas, see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed. Copies of DOE/TIC-7000, the Subject Thesaurus, are available from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161.

A

A CODES
ARC-OLOGY via TELL-A-GRAF, 11:31289 (R;US)

AAF
See ACETYLAMINOFLUORENES

ABANDONED SITES
Acid Mine Drainage
Coal industry perspectives on nonpoint source pollution, 11:29191 (RA;US)
Erosion
Coal industry perspectives on nonpoint source pollution, 11:29191 (RA;US)

ABNORMALITIES (CHROMOSOMAL)
See CHROMOSOMAL ABERRATIONS

ABSCISIC ACID
Biological Effects
Abscisic acid accelerates adaptation of cultured tobacco cells to salt, 11:30645 (J;US)
Tissue Distribution
Guard cell biochemistry: response to environmental stimuli causing changes in gas exchange, 11:29501 (R;US)
Movement of abscisic acid into the apoplast in response to water stress in Xanthium strumarium L., 11:30678 (J;US)
Uptake
Abscisic acid accumulation in spinach leaf slices in the presence of penetrating and nonpenetrating solutes, 11:30682 (J;US)
Relationship between stress-induced ABA and proline accumulations and ABA-induced proline accumulation in excised barley leaves, 11:30675 (J;US)

ABSORPTION REFRIGERATION CYCLE
Thermodynamics
Advanced absorption solar air-conditioning systems: thermal modeling and design aspects, 11:29597 (RA;US)
Working Fluids
Thermodynamic properties state equations of pure methanol and methanol-LiBr . $ZnBr_2$ solutions used in vapor absorption refrigeration and air-conditioning cycle, 11:29595 (RA;US)

ABU DHABI
See UNITED ARAB EMIRATES

ACCELERATORS
See also HEAVY ION ACCELERATORS
PARTICLE BEAM FUSION ACCELERATOR
RAILGUN ACCELERATORS
Energy Storage
Scaling experiments on plasma opening switches for inductive energy storage applications, 11:31265 (BA;US)
Scaling Laws
RFQ scaling-law implications and examples, 11:30413 (R;US)

ACCELEROMETERS
Design
Multiple-stage integrating accelerometer, 11:30501 (P;US)

ACCIDENTAL INTAKE
See ACCIDENTS

ACCIDENTAL IRRADIATION
See RADIATION ACCIDENTS

ACCIDENTS
See also RADIATION ACCIDENTS
REACTOR ACCIDENTS
Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)

ACCOUNTING
Real Time Systems
Review of NRTMA statistical tests, 11:29451 (R;GB)

ACES
See QUARKS

ACETAMIDE
Chemical Radiation Effects
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Electron Spin Resonance
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)

ACETATES
Enthalpy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Entropy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Free Enthalpy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Metabolism
Non-aceticlastic methanogenesis from acetate: acetate oxidation by a thermophilic syntrophic coculture, 11:29487 (J;DE)

ACETIC ACID ESTERS
NMR Spectra
Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985 (Cholesteryl acetate), 11:29177 (R;US)

ACETONE
Photolysis
Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals, 11:30286 (J;US)
Solvent Properties
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
ACETOPHENONE
Infrared Spectra
Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985, 11:29183 (R;US)
Liquid Column Chromatography
Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985, 11:29183 (R;US)
ACETYLAMINOFLUORENES
DNA Adducts
Environmental carcinogens in human target tissues in culture. Progress report, 11:30715 (R;US)
Metabolic Activation
Environmental carcinogens in human target tissues in culture. Progress report, 11:30715 (R;US)
ACETYLBENZENE
See ACETOPHENONE
ACETYLENE
Oxidation
Chemical kinetics of hydrocarbon oxidation in gaseous detonations, 11:29489 (J;US)
ACID MINE DRAINAGE
Pollution Abatement
Acid mine drainage: surface mine treatment and in-situ abatement technology, 11:29189 (RA;US)
Pollution Control
Factors and treatment of abandoned acid mine lands for controlling nonpoint source pollution, 11:29192 (RA;US)
ACID RAIN
Air Pollution Control
Acid rain control options - impact on precipitator performance, 11:29734 (RA;US)
Future particulate regulations: the view of the small manufacturer, 11:30568 (RA;US)
Impact of particulate control requirements: large manufacturer's viewpoint, 11:30567 (RA;US)
Atmospheric Chemistry
Urban and local source effects on precipitation chemistry, 11:30552 (J;US)
Chemical Analysis
A case study of the effects of local and distant sources of alkaline material on precipitation in the midwest and plains, 11:30550 (J;US)
Environmental Effects
Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)
Information Systems
Application of a geographic information system in the study of acidic deposition, 11:30609 (R;US)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Legislation
Acid rain control options - impact on precipitator performance, 11:29734 (RA;US)
Impact of particulate control requirements: large manufacturer's viewpoint, 11:30567 (RA;US)
Mitigation
Coal cleaning as an acid rain mitigation strategy: an in-depth examination, 11:29214 (J;US)
Monitoring
A case study of the effects of local and distant sources of alkaline material on precipitation in the midwest and plains, 11:30550 (J;US)
Pollution Regulations
Impact of proposed acid rain legislation on power plant particulate control equipment, 11:29692 (RA;US)
Response Modifying Factors
Exploration of the relationships among acidic deposition, land use, and water chemistry, 11:30578 (R;US)
Statistics
Statistical analysis of relationships between precipitation chemistry and air quality in New Hampshire and precursor emissions, 11:30553 (J;US)
ACTINIDE COMPOUNDS
See also AMERICIUM COMPOUNDS
THORIUM COMPOUNDS
URANIUM COMPOUNDS
Magnetic Properties
Orbital effects in actinide systems, 11:30114 (BA;US)
ACTINIDES
See also ACTINIUM
AMERICIUM
NEPTUNIUM
PLUTONIUM
PROTACTINIUM
THORIUM
URANIUM
Magnetism
Orbital effects in actinide systems, 11:30114 (BA;US)
ACTINIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
ACTIVATED CARBON
Impregnation
Ion-exchange properties of activated carbon filled with hydrous Zr(IV) and Zr(IV)-P(V) oxides, 11:30174 (J;NL)
Sorptive Properties
Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985, 11:30237 (R;US)
Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
ADDUCTS
Chemical Preparation
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Infrared Spectra
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Vibrational States
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
ADENOSINE TRIPHOSPHATASE
See ATP-ASE
ADVANCED TEST IDAHO REACTOR
See ATR REACTOR
AERATION
Cost
Costs of reservoir releases aeration, 11:29495 (R;US)
AERODYNAMICS
Computer Calculations
Proceedings of the 2nd NAL symposium on aircraft computational aerodynamics, 11:30325 (R;JP)
Computerized Simulation
Development of computational fluid dynamics at NASA Ames Research Center, 11:30381 (RA;JP)
Meetings
Proceedings of the 2nd NAL symposium on aircraft computational aerodynamics, 11:30325 (R;JP)
AEROSOLS
See also RADIOACTIVE AEROSOLS
SMOKES
Air Pollution Control
Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort, 11:29281 (BA;US)
Electric Charges
Aerosol particle charging in a pulsed corona discharge, 11:29715 (RA;US)

Light Scattering
Single scattering from nonspherical Chebyshev particles: a compendium of calculations, 11:30888 (R;US)
Removal
Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort, 11:29281 (BA;US)
Slip Flow
Slip correction measurements for aerosol particles of doublet and triangular triplet aggregates of spheres, 11:30821 (RA;US)
Transport
Local transport of vertically- and horizontally-emitted sodium oxide aerosols, 11:29778 (R;US)

AGRICULTURAL RESIDUES
See AGRICULTURAL WASTES

AGRICULTURAL WASTES
Anaerobic Digestion
Critical evaluation of anaerobic fermentation of waste products 'a management study', 11:29484 (R;FR)
Experiences on handling liquid substrates of high solid content in agricultural biogas-plants, 11:29481 (RA;DE)

AGRICULTURE
Distribution
Distribution maps - national fertilizer programs; agricultural programs in the seven Tennessee Valley states; Tennessee Valley region: major land uses, livestock inventories, farm products, 11:30689 (R;US)
Energy Consumption
1975, 1976 Energy Consumption Data Base for the Industrial Sector. Volume 3. Computer-related documentation. Final report, 11:29948 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report, 11:29979 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
Maps
Distribution maps - national fertilizer programs; agricultural programs in the seven Tennessee Valley states; Tennessee Valley region: major land uses, livestock inventories, farm products, 11:30689 (R;US)

AIR
See also SURFACE AIR
Radiation Monitoring
Stack monitor for the proof-of-breeding project, 11:30431 (J;US)
Radionuclide Migration
Remedial waste management practices resulting in the decline of airborne plutonium adjacent to a liquid waste disposal ditch at the Hanford site, 11:29435 (RA;US)

AIR HEATERS
Operation
Analysis of air heater - fly ash - sulfuric acid vapor interactions, 11:29723 (RA;US)

AIR INFILTRATION
Flow Models
Air leakage flow correlations for varying house construction types, 11:30002 (R;US)

AIR POLLUTION
Absorption Spectroscopy
Measurements of neutral constituents using far infrared remote sensing techniques, 11:30539 (R;IT)
Data Acquisition
Airborne Lidar measurements of aerosols, mixed layer heights, and ozone during the 1980 PEPE/NEROS summer field experiment, 11:30538 (R;US)
Diffusion
Application of the methods of statistical analysis of pseudo-random signals to the interpretation of fields trials on the atmospheric transport of active products and to estimate of confidence limits, 11:30536 (R;FR)
Forecasting
Forecasting future industrial SO_x and NO/sub x/ emissions, 11:30551 (J;US)
Mathematical Models
Forecasting future industrial SO_x and NO/sub x/ emissions, 11:30551 (J;US)
Monitoring
Airborne Lidar measurements of aerosols, mixed layer heights, and ozone during the 1980 PEPE/NEROS summer field experiment, 11:30538 (R;US)
Contribution to the study of radioactive and heavy jets discharged in the presence of a cross-stream, 11:30560 (R;FR;In French)
Measurements of neutral constituents using far infrared remote sensing techniques, 11:30539 (R;IT)
Microwave limb sounder for stratospheric measurements, 11:30181 (R;US)
Turbulent Flow
Application of the methods of statistical analysis of pseudo-random signals to the interpretation of fields trials on the atmospheric transport of active products and to estimate of confidence limits, 11:30536 (R;FR)

AIR POLLUTION CONTROL
Use this term for items that involve the removal or management of pollutants after they are formed by a source.
Economic Analysis
Critical electrostatic precipitator purchasing concepts, 11:29738 (RA;US)
Legislation
Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
Manuals
Technical manual on the identification, assessment, and control of fugitive emissions, 11:30532 (RA;US)
Mathematical Models
Microcomputer models for particulate control, 11:29691 (RA;US)

AIR PREHEATERS
See AIR HEATERS

AIR QUALITY
Forecasting
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
Mathematical Models
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
Monitoring
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
Standards
Future particulate regulations: the view of the small manufacturer, 11:30568 (RA;US)
Impact of coming particulate control requirements on the iron and steel industry, 11:30566 (RA;US)

AIRBORNE PARTICLES
See PARTICULATES

AIRBORNE PARTICULATES
See PARTICULATES

AIRCRAFT ACCIDENTS
See ACCIDENTS

AIRCRAFT FUELS
See AVIATION FUELS

AJMAN
See UNITED ARAB EMIRATES

ALARA
All exposures shall be kept as low as reasonably achievable, economic and social factors being taken into account.
Research Programs
Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)

ALARM DOSEMETERS
See RADIATION MONITORS

ALASKAN NORTH SLOPE
Birds
Forty-fourth breeding bird census, 11:30575 (J;US)

Geochemistry
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)
Petroleum Deposits
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)
Petroleum Geology
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)

ALASKITES
See APLITES

ALCATOR DEVICE
ICR Heating
Experimental measurements of the ion cyclotron antennas' coupling and RF characteristics, 11:31193 (J;US)
Material and electromagnetic properties of Faraday shields for ion cyclotron heating antennas, 11:31191 (J;US)
Impurities
The source of heavy impurities in the Alcator C Tokamak, 11:31021 (BA;US)
Plasma Diagnostics
X-ray spectra for 10 keV less than h v less than 100 keV from the Alcator C tokamak, 11:31017 (BA;US)
X-Ray Spectra
X-ray spectra for 10 keV less than h v less than 100 keV from the Alcator C tokamak, 11:31017 (BA;US)

ALCOHOL FUELS
Use for pure alcohols, alcohol-water mixtures, or alcohols with additives; for alcohol-gasoline mixtures, use GASOHOL.
See also ETHANOL FUELS
METHANOL FUELS
Bench-Scale Experiments
Endurance test of a high speed diesel engine using ethanol fuel, 11:30038 (R;FI;In Finnish)
Combustion
Alcohol as a fuel in a high speed diesel engine with double injection system, 11:30041 (R;FI;In Finnish)
Exhaust Gases
Exhaust gas analysis of a diesel engine using alcohol as a fuel, 11:30040 (R;FI;In Finnish)
Fuel Additives
Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines, 11:30037 (R;FI;In Finnish)
Fuel Injection Systems
Cold-start tests with speed diesel engines using alcohol as main fuel, 11:30042 (R;FI;In Finnish)
Endurance test of a high speed diesel engine using ethanol fuel, 11:30038 (R;FI;In Finnish)
Ignition Quality
Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines, 11:30037 (R;FI;In Finnish)

ALCOHOLATES
See ALKOXIDES

ALCOHOLS
See also GLYCOLS
METHANOL
Membrane Transport
Abscisic acid accumulation in spinach leaf slices in the presence of penetrating and nonpenetrating solutes, 11:30682 (J;US)

ALDEHYDES
Separation Processes
Selectivity variations in anion chromatography, 11:30184 (D;US)

ALDEHYDO ACIDS
See ALDEHYDES

ALFALFA
Photosynthesis
Photosynthate supply and utilization in alfalfa: a developmental shift from a source to a sink limitation of photosynthesis, 11:30698 (J;US)
Radionuclide Kinetics
Photosynthate supply and utilization in alfalfa: a developmental shift from a source to a sink limitation of photosynthesis, 11:30698 (J;US)

ALGERIA
Energy Policy
Algeria - energy situation 1984, 11:29925 (R;DE;In German)
Energy Supplies
Algeria - energy situation 1984, 11:29925 (R;DE;In German)

ALGORITHMS
Numerical Solution
Low frequency electromagnetic field computation in three dimensions, 11:30329 (R;GB)

ALKALI METALS
See also CESIUM
LITHIUM
POTASSIUM
RUBIDIUM
SODIUM
Energy Levels
Theoretical studies of resonance enhance stimulated raman scattering (RESRS) of frequency doubled Alexandrite laser wavelengths in cesium vapor. Semiannual report, 11:30364 (R;US)

ALKALINE EARTH METALS
See also BARIUM
BERYLLIUM
CALCIUM
MAGNESIUM
RADIUM
STRONTIUM
Separation Processes
Eluent and ligand effects in cation chromatography, 11:30185 (D;US)

ALKALIS
See HYDROXIDES

ALKANES
See also BUTANE
DECANE
ETHANE
METHANE
PROPANE
Chemical Reactions
Process for preparing 2,3 dihydroxybenzoic acid amides of tetraaraalkanes and cycloalkanes, 11:29242 (P;US)
Energy Transfer
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Isomerization
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Metabolism
Microbial biosurfactant - physiology, biochemistry, and applications, 11:29247 (J;US)
Oxidation
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Photolysis
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)

ALKENES
See also BUTENES
CYCLOALKENES
ETHYLENE
HEXENES
PROPYLENE
Dimerization
I. Kinetic and mechanistic study of the [4+4] dimerization of 2,3-dimethylene-2,3-dihydrofuran. II. Preparation of 2,3-dimethylene-2,3-dihydrobenzo[B]furan by the flash vacuum pyrolysis of 2-methyl-3-benzo[B]furylmethyl benzoate. III. Reaction of 2,3-dimethylene-2,3-dihydrofuran with triplet oxygen, 11:30270 (D;US)
Radiolysis
Structure and dynamics of olefin radical cation aggregates. Time-resolved fluorescence detected magnetic resonance, 11:30301 (J;US)

ALKOXIDES
Chemical Reactions
Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_6Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_6(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_6$(M identical with M) and i-PrOH leading to $W_2(H)_2(O\text{-}i\text{-}Pr)_{14}$, 11:30210 (J;US)

Crystal Structure
Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_3(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_6$(M identical with M) and i-PrOH leading to $W_2(H)_2(O\text{-}i\text{-}Pr)_{14}$, 11:30210 (J;US)
Molecular Structure
Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_3(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_6$(M identical with M) and i-PrOH leading to $W_2(H)_2(O\text{-}i\text{-}Pr)_{14}$, 11:30210 (J;US)

ALKYL RADICALS
See also METHYL RADICALS
Detection
Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system, 11:30224 (J;GB)

ALKYLATES
See ALCOHOLS

ALLOY 800
See INCOLOY 800

ALLOY 800H
See INCOLOY 800H

ALLOY NUCLEAR FUELS
Multiplication Factors
HECTOR measurements on plutonium-uranium metal fuel, 11:29815 (R;GB)
Physical Radiation Effects
Gas-bubble growth mechanisms in the analysis of metal fuel swelling, 11:30082 (R;US)
Reactivity
HECTOR measurements on plutonium-uranium metal fuel, 11:29815 (R;GB)
Reactivity change measurements on plutonium uranium oxide fuel clusters in a plutonium uranium metal lattice in HECTOR, 11:29814 (R;GB)
Swelling
Gas-bubble growth mechanisms in the analysis of metal fuel swelling, 11:30082 (R;US)

ALLOY-CB-752
Stability
Thermal aging effects in refractory metal alloys, 11:29786 (R;US)

ALLOY-HD-8077
See NICKEL BASE ALLOYS

ALLOY-HT-9
Fracture Properties
Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22}n/cm^2, 11:31060 (RA;US)
Rapid solidification of candidate ferritic steels, 11:31064 (RA;US)
Microstructure
Rapid solidification of candidate ferritic steels, 11:31064 (RA;US)
Physical Radiation Effects
Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22}n/cm^2, 11:31060 (RA;US)
Effects of irradiation on the fracture toughness of HT-9, 11:31066 (RA;US)
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys (Candidate window materials for SIN beam stop), 11:30099 (R;US)
Poisson Ratio
Poisson's ratio measurements for martensitic stainless steels, 11:31065 (RA;US)
Volatility
Elemental volatility of HT-9 fusion reactor alloy, 11:31240 (J;US)

ALLOY-MA-754
See NICKEL BASE ALLOYS

ALLOY-MA-956
See IRON BASE ALLOYS

ALLOYS
See also ALUMINIUM ALLOYS
ANTIMONY ALLOYS
BRAZING ALLOYS
CALIFORNIUM ALLOYS
CHROMIUM ALLOYS
COBALT ALLOYS
COPPER ALLOYS
CORROSION RESISTANT ALLOYS
GERMANIUM ALLOYS
HEAT RESISTING ALLOYS
INTERMETALLIC COMPOUNDS
IRON ALLOYS
LEAD ALLOYS
LITHIUM ALLOYS
MANGANESE ALLOYS
MOLYBDENUM ALLOYS
NICKEL ALLOYS
NIOBIUM ALLOYS
RHENIUM ALLOYS
SILICON ALLOYS
TANTALUM ALLOYS
TITANIUM ALLOYS
TUNGSTEN ALLOYS
VANADIUM ALLOYS
Cavitation
Mechanics and mechanisms of intergranular cavitation in creeping alloys, 11:30118 (BA;NL)
Corrosion
Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)

ALLOY-WAZ-16
See NICKEL BASE ALLOYS

ALLUVIAL DEPOSITS
Cracks
Inflow to a crack in playa deposits of Yucca Lake, Nevada Test Site, Nye County, Nevada, 11:30745 (R;US)

ALPHA DETECTION
Drift Chambers
New focal plane detector for the magnet spectrometer Big Karl, 11:30480 (J;NL)
Plastic Scintillation Detectors
Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
Position Sensitive Detectors
Detection of charged particles in amorphous silicon layers, 11:30428 (J;US)
Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
Si Semiconductor Detectors
Detection of charged particles in amorphous silicon layers, 11:30428 (J;US)

ALPHA PARTICLES
Emitted by nuclei.
Chemical Radiation Effects
Effects of alpha irradiation on barium hollandite and nickel-iron spinel, 11:30306 (J;US)
Transport Theory
Alpha-driven fast magnetosonic wave heating in tokamak plasmas, 11:31007 (J;US)

ALPHA REACTIONS
Excitation Functions
Excitation function and half-life for the fission isomer sup(240m) Pu from the ^{238}U(α, 2n) sup(240m) Pu reaction, 11:30928 (R;BR)

ALPHA-BEARING WASTES
Minimization
Waste Systems progress report, March 1984-February 1985, 11:29413 (R;US)
Packaging
Full scale tests on remote handled FFTF fuel assembly waste handling and packaging, 11:30340 (R;US)
Radioactive Waste Processing
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)
Treatment strategies for transuranic wastes, 11:29412 (R;US)
Remote Handling
Full scale tests on remote handled FFTF fuel assembly waste handling and packaging, 11:30340 (R;US)
Solidification
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)

Underground Disposal
Preliminary Hanford Waste Vitrification Plant waste form qualification plan, 11:29416 (R;US)
Vitrification
Preliminary Hanford Waste Vitrification Plant waste form qualification plan, 11:29416 (R;US)
ALTERNATE FUELS
See SYNTHETIC FUELS
ALUMINIA
See ALUMINIUM OXIDES
ALUMINIUM
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Melting
Electrically conductive containment vessel for molten aluminum, 11:30112 (P;US)
ALUMINIUM 22
Proton Emission Decay
Wide angle measurement of beta-delayed two-proton radioactivity of ^{22}Al, 11:30907 (RA;US)
ALUMINIUM 27 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Neon 20 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Excitation of the Δ resonance in relativistic heavy ion charge exchange reactions, 11:30905 (RA;US)
Oxygen 16 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
ALUMINIUM 28 TARGET
Photonuclear Reactions
Pion photoproduction in nuclei, 11:30892 (R;FR)
ALUMINIUM ALLOYS
Hydridation
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)
ALUMINIUM ARSENIDE SOLAR CELLS
Chemical Vapor Deposition
Experience with OMCVD production of GaAs solar cells, 11:29528 (RA;US)
Efficiency
Evaluation of AlsubxGasub1-xsubAs solar cells, 11:29522 (RA;US)
High-efficiency AlGaAs-GaAs Cassegrainian concentrator cells, 11:29521 (RA;US)
Fabrication
Evaluation of AlsubxGasub1-xsubAs solar cells, 11:29522 (RA;US)
Performance Testing
Mechanically-stacked multijunction solar cells, 11:29555 (BA;US)
Physical Radiation Effects
DLTS analysis of radiation-induced defects in one-MeV electron irradiated germanium and Alsub0.17Gasub0.83As solar cells, 11:29534 (RA;US)
Reflectivity
Optical effects of thin film adhesives in multijunction solar cells, 11:29549 (BA;US)
ALUMINIUM ARSENIDES
Carrier Lifetime
Comparison of Auger recombination in GaInAs-AlInAs multiple quantum well structure and in bulk GaInAs, 11:30156 (RA;AT)
Chlorination
Thermal and ion-assisted reactions of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine, 11:30161 (R;US)
Electronic Structure
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Impurities
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Photoconductivity
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Scattering
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
ALUMINIUM BORIDES
Fabrication
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
Microstructure
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
ALUMINIUM CARBIDES
Fabrication
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
Microstructure
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
ALUMINIUM CHLORIDES
Cations
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2′-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Electron Transfer
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2′-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Radicals
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2′-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
ALUMINIUM OXIDES
See also HOLLANDITE
SPINELS
Breeding Ratio
Thermochemical comparison of the effectiveness of protium purging of fusion breeders, 11:31142 (J;US)
Catalytic Effects
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
Supported f-element complexes: surface chemistry and catalysis. Final report, August 15, 1984-January 14, 1986, 11:30195 (R;US)
Electrochemical Corrosion
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Impurities
Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation, 11:29277 (BA;US)
Mechanical Properties
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Performance Testing
Rapid testing of beta alumina ceramics, 11:29893 (RA;US)

Physical Radiation Effects
Nuclear responses in INTOR plasma stabilization elements, 11:31135 (J;US)
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Porosity
Tritium breeding material : o $LiAlO_2$, 11:31160 (J;US)
Production
Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation, 11:29277 (BA;US)
Purification
Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation, 11:29277 (BA;US)
Reviews
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Sorptive Properties
FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3, 11:30214 (J;US)
Temperature Effects
Nuclear responses in INTOR plasma stabilization elements, 11:31135 (J;US)
Thermal Conductivity
Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiAlO_2$ solid breeders with and without irradiation effects, 11:31255 (J;US)

ALUMINUM
See ALUMINIUM

ALVEOLI (PULMONARY)
See LUNGS

AMBERLITE
See ORGANIC ION EXCHANGERS

AMERICIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Personnel Monitoring
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)

AMERICIUM 241
Radioecological Concentration
Distribution of plutonium and americium beneath a 33-year-old liquid waste disposal site, 11:30618 (J;US)

AMERICIUM COMPOUNDS
Separation Processes
Permeation of metal ions through a series of two complementary supported liquid membranes, 11:30187 (J;NL)

AMES TEST
See MUTAGEN SCREENING

AMIDES
See also ACETAMIDE
Chemical Preparation
Process for preparing 2,3 dihydroxybenzoic acid amides of tetraaraalkanes and cycloalkanes, 11:29242 (P;US)

AMINES
See also ANILINE
HISTAMINE
POLYCYCLIC AROMATIC AMINES
Photochemical Reactions
Photoinduced C-C bond cleavage via electron-transfer reactions: visible-light-mediated scission of tertiary amines, 11:30288 (J;US)
Synthesis
Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
Tissue Distribution
Design, synthesis and evaluation of redox radiopharmaceuticals: a potential new approach for the development of brain imaging agents, 11:30651 (R;US)

AMINO ACIDS
Organic acids containing both a basic amino group and an acidic carboxyl group.
See also ARGININE
CYSTEINE
EDTA
GLUTAMIC ACID
LEUCINE
PROLINE
VALINE
Photochemical Reactions
Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study, 11:30296 (J;GB)
Weak Neutral Currents
Weak neutral currents and the origin of biomolecular chirality, 11:30632 (J;GB)

AMINO ALCOHOLS
See ALCOHOLS
AMINES

AMINO SUGARS
See AMINES

AMINOBENZENE
See ANILINE

AMINOGLUTARIC ACID-ALPHA
See GLUTAMIC ACID

AMINOGLYCIDES
See AMINES

AMINOISOCAPROIC ACID-ALPHA
See LEUCINE

AMINOISOVALERIC ACID-ALPHA
See VALINE

AMMONIA
Adsorption
Field study of a combined NH_3-SO_2 conditioning system on a cold-side fly ash precipitator at a coal-fired power plant, 11:29701 (RA;US)
Aerial Monitoring
Aircraft and ground measurements of ammonia in Kentucky, 11:30547 (J;GB)
Chemical Reaction Kinetics
Kinetics of the reaction OH + NH_3, 11:30208 (J;US)
Rate constant for the reaction H + NH_3 over the temperature range 750-1777 K, 11:30209 (J;US)
Ecological Concentration
Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
Inventories
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Ion Exchange
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
Monitoring
Aircraft and ground measurements of ammonia in Kentucky, 11:30547 (J;GB)
Production
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Pyrolysis
Kinetics of the reaction OH + NH_3, 11:30208 (J;US)
Removal
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
Solvent Properties
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)

AMMONIUM COMPLEXES
Comparative Evaluations
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)

AMMONIUM COMPOUNDS
Ecological Concentration
Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
Excretion
Nitrogen regeneration by the subtropical marine copepod Eucalanus pileatus, 11:30657 (J;GB)

AMORPHOUS STATE
Crystal Structure
Nuclear magnetic resonance studies of amorphous silicon hydrides: proton spin dynamics, 11:30223 (D;US)
AMYLUM
See STARCH
ANADROMOUS FISHES
See also STRIPED BASS
Behavior
Smolt passage behavior and flow-net relationship in the forebay of John Day Dam. Final report 1985, 11:29494 (R;US)
Labelling
Study to determine the biological feasibility of a new fish tagging system. Annual report 1984, 11:30685 (R;US)
Migration
Monitoring of downstream salmon and steelhead at federal hydroelectric facilities. Annual report 1985, 11:29493 (R;US)
ANGIOGRAPHY
See BIOMEDICAL RADIOGRAPHY
ANILINE
Redox Potential
Kinetics of one-electron transfer reactions involving ClO_2 and NO_2, 11:30204 (J;US)
ANIMAL CELLS
Includes human cells.
See also CHO CELLS
Holography
Method and apparatus for molecular imaging using x-rays at resonance wavelengths, 11:30503 (P;US)
Image Processing
Method and apparatus for molecular imaging using x-rays at resonance wavelengths, 11:30503 (P;US)
Molecular Structure
Method and apparatus for molecular imaging using x-rays at resonance wavelengths, 11:30503 (P;US)
ANIMAL TISSUES
See also BONE MARROW
EPITHELIUM
Magnetic Fields
Biological effects of stationary magnetic fields, 11:30733 (BA;US)
ANIONS
See also HYDROGEN IONS 1 MINUS
Absorption Spectroscopy
Transient phenomena in the pulse radiolysis of retinyl polyenes. 4. Environmental effects on absorption maximum of retinal radical anion, 11:30302 (J;US)
Chemical Reaction Kinetics
Transient phenomena in the pulse radiolysis of retinyl polyenes. 4. Environmental effects on absorption maximum of retinal radical anion, 11:30302 (J;US)
Chemical Reaction Yield
Production of the nitromethane aci ion by UV irradiation: its effect on detonation sensitivity, 11:30515 (J;US)
Electron Spin Resonance
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Metastable States
Production and destruction of metastable negative ions. Progress report, September 1, 1985-August 31, 1986, 11:30813 (R;US)
Oxidation
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Photochemistry
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Reaction Intermediates
Production of the nitromethane aci ion by UV irradiation: its effect on detonation sensitivity, 11:30515 (J;US)
ANL
Computer Networks
Electronic mail at ANL. Revision, 11:31276 (R;US)
Data Transmission Systems
Electronic mail at ANL. Revision, 11:31276 (R;US)
Radiation Monitoring
Radiation exposure rates and radionuclide concentrations in soil around the Argonne National Laboratory-West Site, 11:30581 (R;US)
Research Programs
Theoretical studies of the energetics and mechanisms of chemical reactions: abstraction reactions, 11:30206 (J;US)
ANNULAR FUEL ELEMENTS
After-Heat Removal
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Heat Transfer
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
Hydraulics
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
ANODES
Materials
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
ANTENNAS
Performance
ICRH coupling in DIII-D, 11:31028 (R;US)
ANTHRACENE
Chemical Reaction Kinetics
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Emission Spectroscopy
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Radiolysis
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Solubility
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)
ANTIMONY
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
ANTIMONY ALLOYS
Magnetic Susceptibility
Magnetic susceptibility of CfN, CfAs, and CfSb, 11:30190 (R;US)
ANTIMONY CHLORIDES
Electron Transfer
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
ANTIPROTONS
Cosmic Ray Propagation
Some topics in cosmic rays, 11:30780 (RA;JP)
ANTRIM SHALES
See BLACK SHALES
APARTMENT BUILDINGS
Passive Solar Cooling Systems
Passive solar design for a high rise housing building in a seismic zone: design development and calculated performance, 11:29594 (RA;US)
APLITES
Geologic Fractures
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
Lithology
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
APPARATUS
See EQUIPMENT

APPLE COMPUTERS
Uses
400 Hz welding transformer gun assembly evaluation. Final report, 11:30394 (R;US)
AQUATIC ECOSYSTEMS
See also WETLANDS
Biogeochemistry
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Mathematical Models
Using aquatic simulation models for impact assessment: evaluation of monitoring programs, 11:30614 (RA;US)
Population Dynamics
Periphyton production and grazing rates in a stream measured with a ^{32}P material balance method, 11:30606 (J;DK)
Predator-Prey Interactions
Periphyton production and grazing rates in a stream measured with a ^{32}P material balance method, 11:30606 (J;DK)
Risk Assessment
Ecological risk analysis: prospects and problems, 11:30601 (RA;US)
Evaluating environmental exposure through innovative biological tests, 11:30597 (RA;US)
Overview of risk assessment in aquatic ecology, 11:30596 (RA;US)
Statistical approaches for quantitatively assessing ecological impacts and risks, 11:30600 (RA;US)
Use of aquatic microcosms for hazard identification, 11:30611 (RA;US)
Use of time series methods for estimating hazard, 11:30599 (RA;US)
Statistical Models
Stochastic models for predicting environmental impact in aquatic ecosystems, 11:30615 (RA;US)
AQUIFERS
Hydrology
Method for isolating two aquifers in a single borehole, 11:30405 (P;US)
Radionuclide Migration
Calculation of dose rates from critical radionuclides in low-level radioactive waste disposal, 11:29444 (RA;US)
Sensible Heat Storage
Store heat underground, 11:29878 (J;US)
Well Logging
Method for isolating two aquifers in a single borehole, 11:30405 (P;US)
ARAB REPUBLIC OF EGYPT
See EGYPTIAN ARAB REPUBLIC
ARABIDOPSIS
Mutants
Alterations in growth, photosynthesis, and respiration in a starchless mutant of Arabidopsis thaliana (L.) deficient in chloroplast phosphoglucomutase activity, 11:30627 (J;US)
Photosynthesis
Alterations in growth, photosynthesis, and respiration in a starchless mutant of Arabidopsis thaliana (L.) deficient in chloroplast phosphoglucomutase activity, 11:30627 (J;US)
ARDENNES B-1 REACTOR
Project of the advanced PWR reactor N4, at Chooz, 11:29768 (R;FR;In French)
ARGININE
Ion Sources
Molecular secondary ionization source for use with a high performance tandem mass spectrometer, 11:30277 (J;NL)
Ionization
Molecular secondary ionization source for use with a high performance tandem mass spectrometer, 11:30277 (J;NL)
Mass Spectroscopy
Molecular secondary ionization source for use with a high performance tandem mass spectrometer, 11:30277 (J;NL)
ARGON
Chemical Reactions
Chemiluminescence of CS_2i initiated by a thermal energy charge-transfer reaction with Ar^+, 11:30212 (J;US)
Compression
Structural transitions and metallization in compressed solid argon, 11:30167 (J;US)
Crystal-Phase Transformations
Structural transitions and metallization in compressed solid argon, 11:30167 (J;US)
Electron Mobility
Calculation of the mobility of electrons injected in liquid argon, 11:30168 (J;US)
Glow Discharges
Magnetic fluorescent lamp having reduced ultraviolet self absorption, 11:30402 (P;US)
Ionization
Electron energy distributions and excitation rates in high-frequency argon discharges, 11:30977 (R;FR)
Radiolysis
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
ARGON METHOD
See ISOTOPE DATING
ARGONNE NATIONAL LABORATORY
See ANL
ARKANSAS POWER-LIGHT-1 REACTOR
See ARKANSAS-1 REACTOR
ARKANSAS-1 REACTOR
Pope, Arkansas, USA
Low-Level Radioactive Wastes
Durasil ion exchangers: experience at Arkansas Nuclear One, 11:29351 (RA;US)
AROMATIC COMPOUNDS
See AROMATICS
AROMATICS
See also ANILINE
BENZENE
PHENOLS
POLYCYCLIC AROMATIC HYDROCARBONS
POLYPHENYLS
QUINONES
TETRALIN
Nuclear Magnetic Resonance
Proton and deuterium NMR experiments in zero field (Perdeuterated p-demethoxybenzene, perdeuterated malonic acid, diethyl terephthalate-d4, nonadecane-2,2'-D2, sodium propionate-D2), 11:30814 (R;US)
Structural Chemical Analysis
Identifying alkylbenzene isomers with chemical ionization-proton exchange mass spectrometry, 11:30268 (J;US)
ARRAY PROCESSORS
Algorithms
Algorithms + Alchemy = Architectures, 11:31290 (BA;US)
Configuration
Image processor architectures and a data-driven image processore: TIP-1, 11:31281 (RA;JP)
Design
Simulating a small turboshaft engine in real-time multiprocessor simulator (RTMPS) environment, 11:30035 (R;US)
Image Processing
Image processor architectures and a data-driven image processore: TIP-1, 11:31281 (RA;JP)
Mapping
Algorithms + Alchemy = Architectures, 11:31290 (BA;US)
Reviews
Image processor architectures and a data-driven image processore: TIP-1, 11:31281 (RA;JP)
ARSENIC
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
ARSENIC COMPOUNDS
Detection
Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system, 11:30224 (J;GB)
ARSONIUM COMPOUNDS
See ARSENIC COMPOUNDS

ARYL RADICALS
Detection
Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system, 11:30224 (J;GB)
ASDEX TOKAMAK
ICR Heating
Material and electromagnetic properties of Faraday shields for ion cyclotron heating antennas, 11:31191 (J;US)
ASHES
See also FLY ASH
Biological Effects
Fertilization with peat and wood ashes - effects on biomass production, nutrient balance and uptake of heavy metals, 11:29547 (R;SE;In Swedish)
ATF TORSATRON
Design
The Advanced Toroidal Facility (ATF), 11:31194 (J;US)
ATMOSPHERIC CIRCULATION
Mathematical Models
Lidar observations of mixed layer dynamics: tests of parameterized entrainment models of mixed layer growth rate, 11:30523 (J;US)
Seasonal Variations
Plateau monsoons of the northern hemisphere: a comparison between North America and Tibet, 11:30522 (J;US)
ATMOSPHERIC EXPOSURE CHAMBERS
See EXPOSURE CHAMBERS
ATOMIC BOMBS
See NUCLEAR WEAPONS
ATOMIC IONS
Coordinate the above descriptor with a descriptor for the appropriate specific ion.
Angular Distribution
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
Charged-Particle Transport
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
Computerized Simulation
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
Energy Dependence
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
Sputtering
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
ATOMIC WEAPONS
See NUCLEAR WEAPONS
ATOM-MOLECULE COLLISIONS
Integral Cross Sections
$F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
ATP-ASE
Code numbers 3.6.1.3 and 3.6.1.8.
Enzyme Activity
Enzymatic assay for calmodulins based on plant NAD kinase activity, 11:30640 (J;US)
ATR REACTOR
Radioactive Waste Processing
Radwaste processing at the Advanced Test Reactor facility, 11:29811 (RA;US)
AUFWUCHS
Productivity
Estimates of periphyton mass and stream bottom area using phosphorous-32, 11:30607 (J;GB)
AURORA FACILITY
Krypton Fluoride Lasers
Design optimization of single-main-amplifier KrF laser-fusion systems, 11:31230 (J;US)
AUSTENITIC STEELS
Prior to February, 1978 STEELS and AUSTENITE were used to index this concept.
Chemical Composition
Development of austenitic steel for fast induced-radioactivity decay, 11:31053 (RA;US)
Corrosion
Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium, 11:31037 (RA;US)
Irradiation Procedures
US/Japan collaborative testing program in HFIR and ORR: specimen matrices for HFIR irradiation, 11:31050 (RA;US)
Microstructure
Development of austenitic steel for fast induced-radioactivity decay, 11:31053 (RA;US)
Microstructural examination of several commercial alloys neutron irradiated to 100 dpa, 11:31034 (RA;US)
Physical Radiation Effects
Assessment of helium effects on swelling by reirradiation in FFTF of Path A alloys previously irradiated in HFIR, 11:31048 (RA;US)
Irradiation experiments for the US/Japan collaborative testing program in HFIR and ORR, 11:31052 (RA;US)
Microstructural examination of several commercial alloys neutron irradiated to 100 dpa, 11:31034 (RA;US)
Reirradiation in FFTF of swelling-resistant Path A alloys previously irradiated in HFIR, 11:31047 (RA;US)
Swelling behavior of titanium-modified alloys in EBR-II, 11:31054 (RA;US)
Swelling of Fe-Cr-Mn ternary alloys in FFTF, 11:31055 (RA;US)
AUSTRALIA
See also QUEENSLAND
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Oil Shale Deposits
Marketable transport fuels from Julia Creek shale oil, 11:29273 (BA;US)
Review of oil shale research in Australia, 11:29939 (BA;US)
AUSTRIA
Forests
Comparison of the methods of survey adopted in the Federal Republic of Germany and Austria, 11:30713 (RA;DE;In German)
AUTOMOBILE EFFICIENCY STANDARDS
See AUTOMOBILES STANDARDS
AUTOMOBILES
Diesel Engines
Advanced adiabatic diesel engine for passenger cars, 11:30045 (B;US)
Internal Combustion Engines
Patterns of vehicle misfueling in 1981 and 1982: where, when, what vehicles, and how often?, 11:30044 (B;US)
AUTOMOTIVE FUELS
Chemical Preparation
Marketable transport fuels from Julia Creek shale oil, 11:29273 (BA;US)
AVIATION FUELS
Chemical Preparation
Marketable transport fuels from Julia Creek shale oil, 11:29273 (BA;US)

B

B MESONS
Lifetime
Lifetime measurements of hadrons containing heavy quarks at PETRA and PEP, 11:30843 (R;GB)
BACKGROUND RADIATION
Compton Effect
Sunyaev-Zeldovich effect at 1.15 mm wavelength, 11:30802 (RA;GB)
BACTERIA
See also ESCHERICHIA COLI
METHANOGENIC BACTERIA

Growth
Microbial biosurfactant - physiology, biochemistry, and applications, 11:29247 (J;US)
BAGHOUSES
Design
Design and operation of the baghouse at Holcomb Station, Unit No. 1, 11:29732 (RA;US)
Economics
Air pollution control: maintenance cost savings from the washing, patching and reuse of bags used in fabric filters, 11:30406 (RA;US)
Comparison of dry injection systems at normal and high flue gas temperatures, 11:29195 (RA;US)
Operation
Design and operation of the baghouse at Holcomb Station, Unit No. 1, 11:29732 (RA;US)
Performance Testing
Spray dryer/baghouse experiences on a 1000 ACFM pilot plant, 11:29731 (RA;US)
BALLISTIC MISSILE DEFENSE
Feasibility Studies
Simple ballistic-missile-defense model to help decision makers, 11:30517 (J;US)
BANKS
See COMMERCIAL BUILDINGS
BARIUM
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
BARIUM FLUORIDES
Materials Testing
Radiation damage studies on BaF_2 and BGO scintillator materials, 11:30472 (J;US)
Physical Radiation Effects
Radiation damage studies on BaF_2 and BGO scintillator materials, 11:30472 (J;US)
Radiation damage test of barium fluoride scintillator, 11:30495 (J;NL)
BASALT
Sorptive Properties
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Stresses
State of in situ stresses determined by hydraulic fracturing at the Hanford Site, 11:29415 (R;US)
BASOPHILS
Receptors
Test of a theory relating to the cross-linking of IgE antibody on the surface of human basophils, 11:30626 (J;US)
BATTELLE PACIFIC NORTHWEST LABORATORIES
Research Programs
Research on geothermal chemistry and advanced instrumentation, 11:29628 (RA;US)
BATTERIES (ELECTRIC)
See ELECTRIC BATTERIES
BATTERIES (ISOTOPIC)
See RADIOISOTOPE BATTERIES
BEAM DUMPS
Design
Active beam dump module design for MFTF-B, 11:31206 (J;US)
BEAM DYNAMICS
Hamiltonians
Introduction to the nonlinear dynamics arising from magnetic multipoles, 11:30412 (R;US)
BEAM PROFILES
Computerized Simulation
Modeling of non-Gaussian beamlet profile based on total-beam power loss and transmission, 11:30999 (J;US)
BEAM SEPARATORS
For velocity separation of secondary beams.
Design
Modified 180° separation magnet for DIII-Big Dee neutral beam injectors, 11:31207 (J;US)
BEAM WIDTHS
See BEAM PROFILES
BEAM-PLASMA SYSTEMS
Estimates of maximum trappable ion beam power in plasma channels, 11:30982 (R;US)
BEAMS
See also ION BEAMS
POLARIZED BEAMS
Beam Transport
Modeling of non-Gaussian beamlet profile based on total-beam power loss and transmission, 11:30999 (J;US)
Power Losses
Modeling of non-Gaussian beamlet profile based on total-beam power loss and transmission, 11:30999 (J;US)
BEAUTY PARTICLES
Particle Decay
Heavy flavour photoproduction and decay, 11:30850 (R;US)
Photoproduction
Heavy flavour photoproduction and decay, 11:30850 (R;US)
BEAVER VALLEY-2 REACTOR
Shippingport, Pennsylvania, USA
Radioactive Waste Facilities
Radiation protection features of Beaver Valley, 11:29763 (RA;US)
BELGIUM
Service Sector
Electricity consumption in Belgium's service sector, 11:29956 (RA;US)
BELT CONVEYORS
Weight Indicators
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
BENTONITE
Hydrothermal Alteration
Hydrothermal stability of bentonite-based buffer materials, 11:30149 (R;CA)
Mineralogy
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
Thermal Conductivity
Thermal properties of clay-based buffer materials for a nuclear fuel waste disposal vault, 11:30147 (R;CA)
BENZENE
Chemical Preparation
Formation of benzene by the pyrolysis of 4-vinylcyclohexene regiospecific formation of anthracenes in the pyrolysis of dibenzosuberones and related systems, 11:30271 (D;US)
In situ study of the hydrogenation of diphenyl ether in the presence of pyrrhotite and H_2S, 11:30257 (J;US)
Chemical Reaction Kinetics
Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985, 11:30234 (R;US)
Dissociation
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Polymerization
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
Pyrolysis
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Vulcanization
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
BENZOFURANS
Solubility
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)
BENZOPHENONE
Photochemical Reactions
Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study, 11:30296 (J;GB)

BENZOPYRENE
Sorptive Properties
Influence of carbonaceous particles on the interaction of coal combustion stack ash with organic matter, 11:29185 (J;US)
BENZOPYRROLES
See INDOLES
BERYLLIUM
Electrorefining
Waste Systems progress report, March 1984-February 1985, 11:29413 (R;US)
Materials Testing
An assessment of radiation effects in beryllium, 11:31249 (J;US)
Mechanical Tests
Thermomechanical testing of beryllium for limiters in ISX-B and jet, 11:31238 (J;US)
Neutron Leakage
Measurements and calculations of the leakage multiplication from hollow beryllium spheres, 11:31154 (J;US)
Physical Radiation Effects
An assessment of radiation effects in beryllium, 11:31249 (J;US)
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems, 11:31248 (J;US)
Service Life
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems, 11:31248 (J;US)
Temperature Effects
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems, 11:31248 (J;US)
Thermomechanical testing of beryllium for limiters in ISX-B and jet, 11:31238 (J;US)
Thermal Fatigue
Thermomechanical testing of beryllium for limiters in ISX-B and jet, 11:31238 (J;US)
BERYLLIUM 9 TARGET
Neutron Reactions
Evaluation of neutron nuclear data of ^{9}Be for JENDL-3, 11:30903 (R;JP)
Neutron nuclear data of ^{9}Be adopted in JENDL-2, 11:30900 (R;JP)
BERYLLIUM BASE ALLOYS
Valence
Bulk and surface valence of $YbBe_{13}$, 11:30111 (J;CH)
BERYLLIUM MODERATORS
See BERYLLIUM
BGO DETECTORS
Materials Testing
Radiation damage studies on BaF_2 and BGO scintillator materials, 11:30472 (J;US)
Performance
Examination of the role of detection systems in quantitation and image quality in PET, 11:30439 (J;US)
Physical Radiation Effects
Radiation damage studies on BaF_2 and BGO scintillator materials, 11:30472 (J;US)
BINARY-FLUID SYSTEMS
Performance Testing
Heber binary project, 11:29627 (RA;US)
BIOCONVERSION
Coordinated Research Programs
Anaerobic digestion and biocatalysis, 11:29485 (R;GB)
United Kingdom
Anaerobic digestion and biocatalysis, 11:29485 (R;GB)
USA
Anaerobic digestion and biocatalysis, 11:29485 (R;GB)
BIOGAS
See METHANE
BIOGAS PROCESS
Technology Utilization
Critical evaluation of anaerobic fermentation of waste products 'a management study', 11:29484 (R;FR)
BIOLOGICAL REACTORS
See BIOREACTORS
BIOLOGICAL STRESS
Biological Effects
Movement of abecisic acid into the apoplast in response to water stress in Xanthium strumarium L., 11:30678 (J;US)
Remote Sensing
Vegetational stress detection in a southeastern swamp floodplain using remote sensing and in-situ spectral measurements, 11:30620 (R;US)
BIOMASS
Production
Fertilization with peat and wood ashes - effects on biomass production, nutrient balance and uptake of heavy metals, 11:29547 (R;SE;In Swedish)
BIOMASS CONVERSION PLANTS
Use only for plants converting biomass to fuel, do NOT use for plants preparing wastes and biomass for combustion.
Community biogas programmes of Gram Vikas, 11:29472 (RA;DE)
Possibilities and limits of community biogas plants in the frame work of biogas propagation strategy in Viet Nam, 11:29477 (RA;DE)
Socio-economic impacts of community biogas plants in Nepal, 11:29474 (RA;DE)
Some thoughts on the Community Biogas Plants, 11:29473 (RA;DE)
Comparative Evaluations
MINO feasibility study. Concluding report (Pilot plant for gasification of peat and wood), 11:29153 (R;SE)
Demonstration Plants
Development of biogas technology in Ethiopia, 11:29471 (RA;DE)
Economics
Model as an instrument for determining the optimal layout of biogas plants with regard to technical and economical aspects, 11:29483 (RA;DE)
Feasibility Studies
Biogas supply for the fictitious village of Kama in India. Case study, 11:29462 (RA;DE)
Pilot experiment for cooperative community biogas facilities in rural Egypt indicated social failure, 11:29470 (RA;DE)
Variants of biogas supply for the fictitious village of 'Rima', South East Asia, (threshold country). Case study, 11:29463 (RA;DE)
Functional Models
Model as an instrument for determining the optimal layout of biogas plants with regard to technical and economical aspects, 11:29483 (RA;DE)
Meetings
Biogas workshop on community plants. Report, 11:29461 (R;DE)
Operation
Experiences with a low temperature biogas plant, 11:29479 (RA;DE)
Planning
Model as an instrument for determining the optimal layout of biogas plants with regard to technical and economical aspects, 11:29483 (RA;DE)
Research Programs
Pilot experiment for cooperative community biogas facilities in rural Egypt indicated social failure, 11:29470 (RA;DE)
BIOMEDICAL RADIOGRAPHY
See also INDUSTRIAL RADIOGRAPHY.
HgI2 Semiconductor Detectors
Mercuric iodide X-ray camera, 11:30667 (J;US)
Image Processing
3D reconstruction for diverging X-ray beams, 11:30660 (R;FR)
Li-Drifted Si Detectors
300-element silicon-lithium position-sensitive imaging detector for angiography, 11:30430 (J;US)
Position Sensitive Detectors
300-element silicon-lithium position-sensitive imaging detector for angiography, 11:30430 (J;US)
X-Ray Equipment
Mercuric iodide X-ray camera, 11:30667 (J;US)
BIOREACTORS
Prior to March 1983 this concept was indexed to CHEMICAL REACTORS.
Design
Experiences on handling liquid substrates of high solid content in agricultural biogas-plants, 11:29481 (RA;DE)

FAL-biogas R/D project, 11:29482 (RA;DE)
Performance Testing
FAL-biogas R/D project, 11:29482 (RA;DE)
Sealing Materials
Sealing biogas plants with flexible plastic covers. Experiences gained with a German digester, 11:29478 (RA;DE)
BIPYRIDINES
Cations
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2′-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_5$-rich media, 11:30244 (J;US)
Electrochemistry
Pyridinium quenchers of $Ru(bpy)_3^{2+}$ charge effects of the yield of electron transfer, 11:30291 (J;US)
Electron Transfer
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2′-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_5$-rich media, 11:30244 (J;US)
Photolysis
Pyridinium quenchers of $Ru(bpy)_3^{2+}$ charge effects of the yield of electron transfer, 11:30291 (J;US)
Radicals
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2′-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_5$-rich media, 11:30244 (J;US)
Radiolysis
Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)
BIRDS
Habitat
Feasibility study of wood stork foraging habitat mapping using landsat multispectral data, 11:30595 (R;US)
Populations
Forty-fourth breeding bird census, 11:30575 (J;US)
BISMUTH
Chemical Reactions
Reactions of chlorine with liquid metals. 3. Bismuth, 11:30199 (J;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
BISMUTH GERMANATE DETECTORS
See BGO DETECTORS
BISMUTH GERMANATES
Materials Testing
Radiation damage studies on BaF_2 and BGO scintillator materials, 11:30472 (J;US)
Physical Radiation Effects
Radiation damage studies on BaF_2 and BGO scintillator materials, 11:30472 (J;US)
BITTER SPAR
See DOLOMITE
BITUMINOUS COAL
Ash Content
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Chemical Composition
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Comminution
Physical coal beneficiation and electricity costs, 11:29210 (R;GB)
Depolymerization
Improved coal conversion in CO/water systems. Quarterly report No. 5, September 4, 1985-December 3, 1985, 11:29163 (R;US)
Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)
Flotation
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Grinding
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Infrared Spectra
Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)
Particle Size
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Solvent Extraction
Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)
Sorptive Properties
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Structural Chemical Analysis
Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)
Sulfur Content
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Surface Area
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Washing
Physical coal beneficiation and electricity costs, 11:29210 (R;GB)
BL LACERTAE OBJECTS
Cosmic Ray Flux
Blazars, quasars and starbursts, 11:30800 (RA;GB)
BLACK COAL
See also BITUMINOUS COAL
Feasibility Studies
Analyzing the applicability of black coal in public buildings of the Ruhr District, 11:30012 (R;DE;In German)
Federal Republic of Germany
Analyzing the applicability of black coal in public buildings of the Ruhr District, 11:30012 (R;DE;In German)
BLACK HOLES
Space-Time
Spin-3/2 fields on black hole spacetimes, 11:30807 (R;AT)
Spinor Fields
Spin-3/2 fields on black hole spacetimes, 11:30807 (R;AT)
BLACK SHALES
Petrosix Process
Update on the American Syn-Crude/Indiana Shale Oil Project, 11:29272 (BA;US)
BLADES (TURBINES)
See TURBINE BLADES
BLANKETS (BREEDING)
See BREEDING BLANKETS
BLASTING
See EXPLOSIVE FRACTURING

BLASTS
See EXPLOSIONS
BLENDERS
See MIXERS
BLENDING
See MIXING
BLOOD DISEASES
See HEMIC DISEASES
BLUE STELLAR OBJECTS
Infrared Spectra
Infrared observations of blue compact galaxies, 11:30796 (RA;GB)
BNL
Research Programs
Advanced materials for geothermal energy processes, 11:29630 (RA;US)
BOILERS
See also FLUIDIZED BED BOILERS
Efficiency
Factors influencing boiler efficiency, 11:29995 (R;GB)
Feedwater
Water chemistry control and analytical methods at medium pressure power plants, 11:29676 (R;FI;In Finnish)
Operation
Factors influencing boiler efficiency, 11:29995 (R;GB)
BOILING WATER COOLED AND MODERATED REACTO
See BWR TYPE REACTORS
BONE MARROW
Chromosomal Aberrations
Cytogenetic analysis of bone marrow damage, 11:30649 (BA;US)
Sister Chromatid Exchanges
Cytogenetic analysis of bone marrow damage, 11:30649 (BA;US)
BONE MARROW CELLS
Growth
Characterization of subsets of bone marrow-derived macrophages by flow cytometry analysis, 11:30646 (J;US)
BONES
See SKELETON
BONNEVILLE POWER ADMINISTRATION
Geothermal Resources
Geothermal assessment in the Bonneville Power Administration service area, 11:29615 (RA;US)
Research Programs
Geothermal assessment in the Bonneville Power Administration service area, 11:29615 (RA;US)
BOOKKEEPING
See ACCOUNTING
BORANES
Tissue Distribution
Distribution of sulfhydryl boranes in mice and rats, 11:30658 (R;US)
BORATES
Specific compounds, except those of significance to energy research and development, should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Protective Coatings
The effectiveness of building wall boration in controlling the neutron responses in a fusion facility, 11:31242 (J;US)
BOREHOLES
Fracturing
Effects of wellbore liquids in propellant-based fracturing, 11:29251 (R;US)
BORON
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
BORON CARBIDES
Fabrication
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
Microstructure
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
Physical Radiation Effects
Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)
BORON HYDRIDES
Physical Radiation Effects
Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)
BORON PHOSPHIDES
Crystal Growth Methods
Method for production of free standing polycrystalline boron phosphide film, 11:30172 (P;US)
Production
Method for production of free standing polycrystalline boron phosphide film, 11:30172 (P;US)
BOROSILICATE GLASS
Leaching
Solution chemistry of silicate and borate materials, 11:30163 (R;US)
BOROSILICATES
See BOROSILICATE GLASS
BOTSWANA
Biomass Conversion Plants
Biogas technology for water pumping in Botswana, 11:29464 (RA;DE)
BOTTOM MESONS
See B MESONS
BOTTOM PARTICLES
See BEAUTY PARTICLES
BPA
See BONNEVILLE POWER ADMINISTRATION
BRACKISH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS
BRAZIL
Energy Policy
Brazil - energy situation 1984, 11:29932 (R;DE;In German)
Energy Supplies
Brazil - energy situation 1984, 11:29932 (R;DE;In German)
BRAZING ALLOYS
Heating
Brazing technique, 11:30108 (P;US)
BREEDING BLANKETS
Analysis and intercomparison of Phase I experiments at FNS. Article 9, 11:31033 (R;US)
Breeding Ratio
Experimental techniques and measurement accuracies, 11:31157 (J;US)
Thermochemical comparison of the effectiveness of protium purging of fusion breeders, 11:31142 (J;US)
Comparative Evaluations
A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts, 11:31095 (J;US)
Helium-cooled blanket designs, 11:31104 (J;US)
Safety evaluation of the Blanket Comparison and Selection Study, 11:31107 (J;US)
Containment
An assessment of problems associated with tritium containment, 11:31096 (J;US)
Cost Estimation
A systematic methodology for estimating direct capital costs for blanket tritium processing systems, 11:31145 (J;US)
Data Base Management
Structural materials data base assessment for the Blanket Comparison and Selection Study, 11:31100 (J;US)
Design
A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts, 11:31095 (J;US)
A molten salt cooling 17Li-83Pb breeding blanket concept, 11:31140 (J;US)
An assessment of problems associated with tritium containment, 11:31096 (J;US)
Blanket optimization studies for cascade, 11:31162 (J;US)
Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)

Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study, 11:31094 (J;US)
First wall and blanket design for a high wall loading compact tokamak power reactor, 11:31151 (J;US)
Helium-cooled, flibe breeder, beryllium multiplier blanket, 11:31103 (J;US)
Helium-cooled blanket designs, 11:31104 (J;US)
Magnetohydrodynamic considerations for the design of self-cooled liquid-metal fusion reactor blankets, 11:31111 (J;US)
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Safety evaluation of the Blanket Comparison and Selection Study, 11:31107 (J;US)
Uncertainties in prediction of tritium breeding in candidate blanket designs due to present uncertainties in nuclear data base, 11:31087 (J;US)

Energy Absorption
Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study, 11:31094 (J;US)

Failure Mode Analysis
Solid breeder/structure mechanical interaction and thermal stability, 11:31137 (J;US)

Fluid Mechanics
Flow characteristics of the Cascade granular blanket, 11:31159 (J;US)

Fluid-Structure Interactions
Safety considerations of lithium lead alloy as a fusion reactor breeding material, 11:31239 (J;US)

Heat Transfer
Thermal-hydraulic thermomechanical testing of solid breeder blanket modules using microwave energy, 11:31146 (J;US)

Hydraulics
Thermal-hydraulic thermomechanical testing of solid breeder blanket modules using microwave energy, 11:31146 (J;US)

Leakage Current
The influence of leakage currents on MHD pressure drop, 11:31113 (J;US)

Magnetohydrodynamics
Experimental facility for studying MHD effects in liquid metal cooled blankets, 11:31110 (J;US)
Magnetohydrodynamic considerations for the design of self-cooled liquid-metal fusion reactor blankets, 11:31111 (J;US)
MHD flow control as a design approach for self-cooled liquid-metal blankets of magnetic confinement fusion reactors, 11:31112 (J;US)
The influence of leakage currents on MHD pressure drop, 11:31113 (J;US)

Materials Testing
A module for testing a lithium cooled tokamak blanket in a tandem mirror test reactor, 11:31152 (J;US)
Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)
Modeling of tritium transport in lithium aluminate fusion solid breeders, 11:31141 (J;US)
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Structural materials data base assessment for the Blanket Comparison and Selection Study, 11:31100 (J;US)
Test requirements for solid breeder blanket thermal behavior, 11:31134 (J;US)
Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiAlO_2$ solid breeders with and without irradiation effects, 11:31255 (J;US)
Thermal-hydraulic thermomechanical testing of solid breeder blanket modules using microwave energy, 11:31146 (J;US)

Mechanical Properties
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)

Microwave Heating
Thermal-hydraulic thermomechanical testing of solid breeder blanket modules using microwave energy, 11:31146 (J;US)

Neutron Flux
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)

Neutron Transport
A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts, 11:31095 (J;US)

Performance
A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts, 11:31095 (J;US)
Nuclear performance optimization of the Be/Li/Th blanket for the fusion breeder, 11:31133 (J;US)

Performance Testing
A module for testing a lithium cooled tokamak blanket in a tandem mirror test reactor, 11:31152 (J;US)

Physical Radiation Effects
Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study, 11:31094 (J;US)
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)

Porosity
Tritium breeding material : o $LiAlO_2$, 11:31160 (J;US)

Radioactivation
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)

Research Programs
U.S. Blanket Technology Programs, 11:31132 (J;US)

Reviews
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
U.S. Blanket Technology Programs, 11:31132 (J;US)

Shielding
Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study, 11:31094 (J;US)

Stress Analysis
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)

Temperature Effects
Solid breeder/structure mechanical interaction and thermal stability, 11:31137 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)

Thickness
Blanket optimization studies for cascade, 11:31162 (J;US)

Tritium Recovery
Counter current extraction system for tritium recovery from 17Li-83Pb, 11:31144 (J;US)

Vortex Flow
Flow characteristics of the Cascade granular blanket, 11:31159 (J;US)

BREEDING PELLETS

Fluid Mechanics
Flow characteristics of the Cascade granular blanket, 11:31159 (J;US)

Neutron Leakage
Measurements and calculations of the leakage multiplication from hollow beryllium spheres, 11:31154 (J;US)

Vortex Flow
Flow characteristics of the Cascade granular blanket, 11:31159 (J;US)

BRINES

Research Programs
Brine injection studies, 11:29912 (RA;US)
Geothermal research at the Puna Facility. Technical report, 11:29642 (R;US)

BRIQUETS

Drying
Pilot study in producing briquettes from peat, 11:29212 (R;SE;In Swedish)

BROMIDES

See also LITHIUM BROMIDES
ZINC BROMIDES

Oxidation
Use of organic molecules as mechanistic probes for semiconductor-mediated photoelectrochemical oxidations: bromide oxidation, 11:30265 (J;US)

BROMINATED AROMATIC HYDROCARBONS
Dissociation
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Pyrolysis
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)

BROMINE FLUORIDES
Chemical Preparation
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Infrared Spectra
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Vibrational States
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)

BROOKHAVEN NATIONAL LABORATORY
See BNL

BROWNS FERRY-1 REACTOR
Decatur, Alabama, USA
Containment Systems
Analysis of high pressure boil-off situation during MSIV closure ATWS in a typical BWR/4, 11:29826 (R;US)
Risk Assessment
RISKMAN3: an interactive computer code to assist in the review and quantification of system analyses, 11:29867 (R;US)

BSF REACTOR
See BSR-1 REACTOR

BSR-1 REACTOR
Oak Ridge National Laboratory, Oak Ridge, Tennessee
Irradiation Devices
Characterization of the National Low-Temperature Neutron Irradiation Facility, 11:29818 (R;US)
Reactor Physics
Computational methodology for the Oak Ridge Research Reactor (ORR) and Bulk Shielding Reactor (BSR): the VICTORR input processing code for the BOLD VENTURE system. Volume 2, 11:29821 (R;US)

BSR-2 REACTOR
Oak Ridge National Laboratory, Oak Ridge, Tennessee
Irradiation Devices
Characterization of the National Low-Temperature Neutron Irradiation Facility, 11:29818 (R;US)

BUILDING MATERIALS
See also CEMENTS
CONCRETES
Combustion Products
Size fractionation of black and organic particulate carbon from fires. Final report, 11:30537 (R;US)
Physical Properties
Studies of froosh, the thermoregulating indigenous construction material of the Saudi Arabian Gulf Coast, 11:29579 (RA;US)
Research Programs
Building materials research agenda, 11:30016 (R;US)
Sensible Heat Storage
Daily thermal storage for heating and cooling of buildings, 11:29590 (RA;US)

BUILDINGS
See also COMMERCIAL BUILDINGS
CONTAINMENT BUILDINGS
OFFICE BUILDINGS
PUBLIC BUILDINGS
RESIDENTIAL BUILDINGS
Architecture
Computer model for evaluation of form factors and interreflected radiant exchange for irregular geometrics with partial obstruction, 11:29499 (RA;US)
Overview of environmental design methodologies and problems related to passive low energy architecture, 11:29586 (RA;US)
Solar architecture since 1970: passive and low energy innovations, 11:29581 (RA;US)
Building Materials
Studies of froosh, the thermoregulating indigenous construction material of the Saudi Arabian Gulf Coast, 11:29579 (RA;US)
Cold Storage
Attractive economics of thermal storage in new buildings, 11:29976 (RA;US)
Cooling Systems
Attractive economics of thermal storage in new buildings, 11:29976 (RA;US)
Design
Climate of Riyadh and the passive response in traditional buildings, 11:30010 (RA;US)
Electric Power
Compensation of reactive power in buildings, 11:29998 (R;FI;In Finnish)
Energy Conservation
Climate of Riyadh and the passive response in traditional buildings, 11:30010 (RA;US)
Energy economical pilot projects in building industry, 11:29997 (R;FI;In Finnish)
Monitored energy performance of new and retrofitted buildings: some results from the BECA data compilations, 11:29967 (RA;US)
Stockholm project. Quality control of energy-efficient settlement, 11:29992 (R;SE;In Swedish)
Strategy for accelerating the use of energy-conserving building technologies, 11:30019 (J;US)
Energy Consumption
Analysis of energy consumption in administrative buildings, 11:29991 (R;SE;In Swedish)
Calculation of the consumption of electric energy in buildings, 11:29996 (R;FI;In Finnish)
Monitored energy performance of new and retrofitted buildings: some results from the BECA data compilations, 11:29967 (RA;US)
Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study, 11:29999 (R;FI;In Finnish)
Energy Demand
Finite difference algorithm for the evaluation of the response factors of multilayer slabs for dynamic simulation of transient conduction heat flow, 11:30008 (RA;US)
Heat Gain
Effect of wall geometry on net heat gain or loss, 11:30009 (RA;US)
Solar radiation on different oriented vertical surfaces: Riyadh case study, 11:29498 (RA;US)
Heat Losses
Effect of wall geometry on net heat gain or loss, 11:30009 (RA;US)
Heat Transfer
Finite difference algorithm for the evaluation of the response factors of multilayer slabs for dynamic simulation of transient conduction heat flow, 11:30008 (RA;US)
Orientation
Solar radiation on different oriented vertical surfaces: Riyadh case study, 11:29498 (RA;US)
Passive Solar Cooling Systems
Bioclimatic indicators for determining passive and low energy hybrid systems - case study, Saudi Arabia, 11:29585 (RA;US)
Overview of environmental design methodologies and problems related to passive low energy architecture, 11:29586 (RA;US)
Passive Solar Heating Systems
Passive solar heating and analysis, 11:29582 (RA;US)
Solar architecture since 1970: passive and low energy innovations, 11:29581 (RA;US)
Research Programs
Energy economical pilot projects in building industry, 11:29997 (R;FI;In Finnish)
Solar Cooling Systems
Advanced absorption solar air-conditioning systems: thermal modeling and design aspects, 11:29597 (RA;US)

Performance and economic assessment of state-of-the-art solar cooling systems, 11:29573 (RA;US)
Simulation and optimization of design parameters of solar-operated absorption cooling machine, 11:29572 (RA;US)
Simulation of a two-stage solar-operated absorption cooling system, 11:29588 (RA;US)
Solar-powered dual cycle absorption cooling system, 11:29576 (RA;US)
Solar thermoelectric cooling system, 11:29570 (RA;US)
UPM solar cooling project, 11:29577 (RA;US)
Solar Heating Systems
Overview of US solar building research, 11:29575 (RA;US)
Performance and cost experience of active solar-heated buildings, 11:29571 (RA;US)
Solar collectors for building applications, 11:29587 (RA;US)
Solar Water Heaters
Overview of US solar building research, 11:29575 (RA;US)
Thermoelectric Refrigerators
Solar thermoelectric cooling system, 11:29570 (RA;US)
Ventilation Systems
Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study, 11:29999 (R;FI;In Finnish)
Walls
Effect of wall geometry on net heat gain or loss, 11:30009 (RA;US)
BUILDINGS (CONTAINMENT)
See CONTAINMENT BUILDINGS
BULK SHIELDING REACTOR-1
See BSR-1 REACTOR
BULK SHIELDING REACTOR-2
See BSR-2 REACTOR
BUNDLE DIVERTORS
Comparative Evaluations
A comparison study of toroidal-field divertors for a Compact Reversed-Field Pinch Reactor, 11:31176 (J;US)
BUNDLES (FUEL ELEMENTS)
See FUEL ELEMENT CLUSTERS
BURNERS
Computerized Simulation
Basic computer code for industrial burner designs. Part 1: capability test in isothermal swirling flows, 11:30326 (RA;JP)
Design
Basic computer code for industrial burner designs. Part 1: capability test in isothermal swirling flows, 11:30326 (RA;JP)
BURNUP
Measuring Methods
Demonstration of spent-fuel measurement equipment at KWO Obrigheim facility, 11:29766 (R;FR)
Spent Fuels
Demonstration of spent-fuel measurement equipment at KWO Obrigheim facility, 11:29766 (R;FR)
BURSA OF FABRICIUS
See BIRDS
BURUNDI
Biomass Conversion Plants
Potential and development of biogas technology in Burundi: Options and constraints, 11:29465 (RA;DE;In French)
BUTADIENE
Adsorption
Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985, 11:30237 (R;US)
Crystal Structure
Structure and spectral properties of a squarylium dye, 2,4-bis[(1-n-butyl-2(1H)-quinolylidene)methyl]-1,3-cyclobutadienediylium-1,3-diolate, 11:30241 (J;US)
Excited States
Role of geometric distortion in the quenching behaviors of all-trans 1,4-diphenyl-1,3-butadiene triplet, 11:30279 (J;CH)
Photochemistry
Role of geometric distortion in the quenching behaviors of all-trans 1,4-diphenyl-1,3-butadiene triplet, 11:30279 (J;CH)
Visible Spectra
Structure and spectral properties of a squarylium dye, 2,4-bis[(1-n-butyl-2(1H)-quinolylidene)methyl]-1,3-cyclobutadienediylium-1,3-diolate, 11:30241 (J;US)
BUTANE
Adsorption
Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985, 11:30237 (R;US)
BUTENES
Oxidation
Crystallite size effect in the selective oxidation of butene to butadiene on iron oxide. 1. Moessbauer, X-ray, and magnetization characterization of the catalysts, 11:30229 (J;US)
BUTYLENES
See BUTENES
BWR TYPE REACTORS
See also BROWNS FERRY-1 REACTOR
Containment Systems
Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501, 11:29855 (R;US)
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
Tellurium behavior in containment under light water reactor accident conditions, 11:29856 (R;US)
Crack Propagation
Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments, 11:29754 (J;US)
ECCS
Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)
Materials Handling Equipment
Assessment of spent nuclear fuel shipping cask handling capabilities of commercial light water reactors, 11:29304 (R;US)
Materials Testing
Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments, 11:29754 (J;US)
Modifications
Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)
Nuclear Fuels
Department of Energy extended burnup data base. Final report, 11:29749 (R;US)
Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501, 11:29855 (R;US)
Effects of time and other variables on fission product release rates, 11:29748 (R;US)
Pipes
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Pressure Vessels
Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research, 11:29859 (R;US)
Light Water Reactor Pressure Vessel Surveillance Dosimetry Improvement Program. PSF Blind Test workshop minutes. Summary, 11:29750 (R;US)
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Primary Coolant Circuits
Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Radiation Doses
Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)
Radioactive Aerosols
Coupling of aerosol removal mechanisms in rising bubbles, 11:29813 (R;US)
Reactor Accidents
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
Tellurium behavior in containment under light water reactor accident conditions, 11:29856 (R;US)

Reactor Cooling Systems
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
Reactor Decommissioning
Intact decommissioning of nuclear power plants: a dose assessment, 11:29747 (R;US)
Reactor Internals
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Reactor Operation
Plant analyzer development for high-speed interactive simulation of BWR plant transients, 11:29828 (R;US)
Reactor Safety
Hydrogen:air:steam flammability limits and combustion characteristics at intermediate scale, 11:29861 (R;US)
Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)
Regulations
Review of light water reactor regulatory requirements. Identification of regulatory requirements that may have marginal importance to risk. Volume 1, 11:29753 (R;US)
Risk Assessment
Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
Rod Drop Accidents
Effects of rod worth and drop speed on the BWR off-center rod drop accident, 11:29825 (R;US)
Stress Corrosion
Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments, 11:29754 (J;US)
Systems Analysis
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)

C

CABLES
See also ELECTRIC CABLES
Testing
Qualification testing evaluation (QTE) program, FIN A-1051, Case 0686. Bimonthly status report, February-March 1986, 11:29797 (R;US)
CABLES (ELECTRIC)
See ELECTRIC CABLES
CADARACHE (CEA)
See CEA CADARACHE
CADMIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Ecological Concentration
Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States, 11:30524 (R;US)
Environmental Transport
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Genetic Effects
Assignment of genes encoding metallothioneins I and II to Chinese hamster chromosomes 3. Evidence for the role of chromosome rearrangement in gene amplification, 11:30724 (J;US)
Retention
Cadmium retention in the kidneys of chicks as influenced by phytate in the feed, 11:30718 (R;DE;In German)
CADMIUM 106
E3-Transitions
Determination of B(E3;0_1i $\rightarrow 3_1$) values for the stable isotopes of cadmium, 11:30910 (R;AU)
CADMIUM 108
E3-Transitions
Determination of B(E3;$0_1^+ \rightarrow 3_1$) values for the stable isotopes of cadmium, 11:30910 (R;AU)
CADMIUM 110
E3-Transitions
Determination of B(E3;$0_1^+ \rightarrow 3_1$) values for the stable isotopes of cadmium, 11:30910 (R;AU)
CADMIUM 112
E3-Transitions
Determination of B(E3;$0_1^+ \rightarrow 3_1$) values for the stable isotopes of cadmium, 11:30910 (R;AU)
CADMIUM 114
E3-Transitions
Determination of B(E3;$0_1^+ \rightarrow 3_1$) values for the stable isotopes of cadmium, 11:30910 (R;AU)
CADMIUM 116
E3-Transitions
Determination of B(E3;$0_1^+ \rightarrow 3_1$) values for the stable isotopes of cadmium, 11:30910 (R;AU)
CADMIUM SELENIDES
Optical Properties
Enhanced photoredox chemistry in quantized semiconductor colloids, 11:30289 (J;US)
CADMIUM SULFIDE SOLAR CELLS
Fabrication
Status of photovoltaics R & D at SERI, 11:29548 (BA;US)
Thin-film tandem solar cells based on $CuInSe_2$, 11:29550 (BA;US)
Physical Radiation Effects
Photon radiation effects on CdS/CuInSe2 thin film solar cells, 11:29533 (RA;US)
CADMIUM TELLURIDE SOLAR CELLS
Fabrication
Thin-film tandem solar cells based on $CuInSe_2$, 11:29550 (BA;US)
CALCIUM
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
CALCIUM 40 REACTIONS
Exciton Model
Excitations in grazing heavy ion reactions, 11:30931 (R;FR)
CALCIUM 40 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Oxygen 16 Reactions
Alpha-clustering in 75 MeV $^{16}O + ^{40}Ca$ as a collective mass fragmentation process, 11:30908 (R;XA)
CALCIUM CHLORIDES
Recycling
Regeneration and recycle of spent oxide reduction solvent salts used in pyrochemical plutonium recovery operations at Los Alamos, 11:29294 (R;US)
CALCIUM OXIDES
Chemical Reactions
Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures, 11:29158 (R;US)
Chlorination
Regeneration and recycle of spent oxide reduction solvent salts used in pyrochemical plutonium recovery operations at Los Alamos, 11:29294 (R;US)

CALCIUM SILICATES
Compression Strength
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
Microstructure
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
Stability
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
CALCULATIONS (COMPUTER)
See COMPUTER CALCULATIONS
CALCULATIONS (MANY DIMENSIONS)
See MANY-DIMENSIONAL CALCULATIONS
CALDERAS
Hydrothermal Systems
Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings, 11:30747 (R;US)
CALIFORNIA
See also LONG VALLEY
Low-Level Radioactive Wastes
California's response to the Low-Level Radioactive Waste Policy Act of 1980: policy and progress, 11:29321 (RA;US)
CALIFORNIUM 252
Spontaneous Fission
Mass energy correlation measurement in ^{252}Cf spontaneous fission, 11:30927 (R;FR;In French)
CALIFORNIUM ALLOYS
Magnetic Susceptibility
Magnetic susceptibility of CfN, CfAs, and CfSb, 11:30190 (R;US)
CALIFORNIUM ARSENIDES
Magnetic Susceptibility
Magnetic susceptibility of CfN, CfAs, and CfSb, 11:30190 (R;US)
CALIFORNIUM NITRIDES
Magnetic Susceptibility
Magnetic susceptibility of CfN, CfAs, and CfSb, 11:30190 (R;US)
CALIPER LOGGING
Well Logging Equipment
Evaluation and design of a large spacing loop-loop electromagnetic tool, 11:30354 (R;US)
CALORIMETERS
Performance Testing
High temperature calorimeter performance variable study, 11:30498 (R;US)
CALORIMETERS (PARTICLE)
See SHOWER COUNTERS
CALVERT CLIFFS-1 REACTOR
Lusby, Maryland, USA
Reactor Cooling Systems
Pressurized thermal shock evaluation of the Calvert Cliffs Unit 1 Nuclear Power Plant, 11:29774 (R;US)
Reactor Operation
Pressurized thermal shock evaluation of the Calvert Cliffs Unit 1 Nuclear Power Plant, 11:29774 (R;US)
Risk Assessment
Pressurized thermal shock evaluation of the Calvert Cliffs Unit 1 Nuclear Power Plant, 11:29774 (R;US)
Thermal Shock
Pressurized thermal shock evaluation of the Calvert Cliffs Unit 1 Nuclear Power Plant, 11:29774 (R;US)
CAMAC SYSTEM
Computer Application to Measurement And Control.
Design
Waveform sampler CAMAC module, 11:30444 (J;US)
CANADA
See also MANITOBA
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Radioactive Waste Disposal
Canadian nuclear fuel waste management program, 11:29314 (R;CA)
Radioactive Waste Management
Canadian Nuclear Fuel Waste Management Program. 1983 annual report, 11:29309 (R;CA)
Fifteen years of radioactive waste management at Ontario Hydro, 11:29372 (RA;US)
CANCER
See NEOPLASMS
CANDU TYPE REACTORS
Loss of Coolant
Verification tests of a high-temperature transverse creep model for Zr-2.5 wt % Nb pressure tubes, 11:30070 (R;CA)
Natural Convection
Two-phase natural circulation experiments in a pressurized water loop with CANDU geometry, 11:29776 (R;CA)
Primary Coolant Circuits
Two-phase natural circulation experiments in a pressurized water loop with CANDU geometry, 11:29776 (R;CA)
CANISTERS
See CONTAINERS
CAPSICUM
Plant Growth
Influence of shade on the growth and nitrogen assimilation of developing fruits on bell pepper, 11:30656 (J;US)
CAPSULES
Biological Functions
Egg envelopes in vertebrates, 11:30672 (J;US)
Chemical Composition
Egg envelopes in vertebrates, 11:30672 (J;US)
CARBAMATES
Biological Effects
Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
CARBAZOLES
Solubility
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)
CARBINOL
See METHANOL
CARBOHYDRATES
Chemistry
Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986, 11:30236 (R;US)
CARBON
See also ACTIVATED CARBON
CARBON BLACK
GRAPHITE
Activation Analysis
Certification of carbon and nitrogen in molybdenum (BCR No. 23), 11:30178 (R;FR)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Mineral Cycling
Organic carbon-14 in the Amazon River system, 11:30605 (J;US)
CARBON 11
Radiochemistry
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
CARBON 12 REACTIONS
Total Cross Sections
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
CARBON 12 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Neon 20 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)

Oxygen 18 Reactions
Study of some direct reactions at 0° in $^{18}O+^{26}Mg$ and $^{18}O+^{13}C$ systems, 11:30897 (R;FR;In French)
Photonuclear Reactions
Pion photoproduction in nuclei, 11:30892 (R;FR)
CARBON 14
Dose Rates
Calculation of dose rates from critical radionuclides in low-level radioactive waste disposal, 11:29444 (RA;US)
CARBON 14 TARGET
Proton Reactions
Neutron polarimeter for (p, n) measurements at intermediate energies, 11:30487 (J;NL)
CARBON BLACK
Sorptive Properties
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Surface Area
Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)
CARBON COMPOUNDS
See also CARBON SULFIDES
Chemical Preparation
Reactivity of large carbon clusters: spheroidal carbon shells and their possible relevance to the formation and morphology of soot, 11:30248 (J;US)
Chemical Reactions
Theoretical studies of the energetics and mechanisms of chemical reactions: abstraction reactions, 11:30206 (J;US)
Molecular Structure
Reactivity of large carbon clusters: spheroidal carbon shells and their possible relevance to the formation and morphology of soot, 11:30248 (J;US)
CARBON DIOXIDE
Adsorption
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
Adsorption Isotherms
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Air Pollution Control
Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
Biological Effects
Stomatal responses to CO_2 in Paphiopedilum and Phragmipedium: role of the guard cell chloroplast, 11:30681 (J;US)
Chemical Preparation
Enhanced photoredox chemistry in quantized semiconductor colloids, 11:30289 (J;US)
Compressibility
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Density
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Ecological Concentration
Climatic change and the broad-scale distribution of terrestrial ecosystem complexes, 11:30572 (J;NL)
Ion Exchange
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
Phase Diagrams
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Phase Studies
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Reduction
Reduction of carbon dioxide by tris(2,2'-bipyridine) cobalt(I), 11:30225 (J;NL)
Removal
Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
Solubility
Phase behavior of coal fluids: data for correlation development. Report for the period: November 1, 1985-January 31, 1986, 11:29176 (R;US)
Solvent Properties
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)
Thermal Diffusion
Mound activities in chemical and physical research: July-December 1985, 11:30196 (R;US)
CARBON DIOXIDE FIXATION
Temperature Dependence
Temperature dependence of carbon isotope fractionation in CAM plants, 11:30677 (J;US)
CARBON DIOXIDE INJECTION
Additives
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Bench-Scale Experiments
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Comparative Evaluations
Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)
Field Tests
Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)
Phase Studies
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
CARBON FIBERS
Physical Radiation Effects
Effects of high energy radiation on the mechanical properties of epoxy-graphite fiber reinforced composites. Interim report, 1 January- 31 December 1985, 11:30145 (R;US)
CARBON MONOXIDE
Adsorption
Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
Chemical Preparation
Gas evolution oscillators. 6. Quantitative characterization of an experimental system, 11:30262 (J;US)
Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$, 11:30317 (J;US)
Chemical Reaction Kinetics
Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986, 11:30194 (R;US)
Chemical Reaction Yield
Gas evolution oscillators. 6. Quantitative characterization of an experimental system, 11:30262 (J;US)
Combustion
Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986, 11:30194 (R;US)
Crystal Structure
Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$, 11:30317 (J;US)
Oxidation
Kinetics of CO oxidation over Ru(0001), 11:30201 (J;US)
CARBON STEELS
See also STEEL-ASTM-A533-B
Corrosion
Extended storage of low-level radioactive waste: potential problem areas, 11:30079 (RA;US)

Radiation Effects
Extended storage of low-level radioactive waste: potential problem areas, 11:30079 (RA;US)

CARBON SULFIDES
Chemical Reactions
Chemiluminescence of CS_2i initiated by a thermal energy charge-transfer reaction with Ar^+, 11:30212 (J;US)
Chemiluminescence
Chemiluminescence of CS_2^+ initiated by a thermal energy charge-transfer reaction with Ar^+, 11:30212 (J;US)

CARBON TETRACHLORIDE
Electron-Molecule Collisions
S-wave threshold in electron attachment - observations and cross sections in CCl4 and SF6 at ultralow electron energies, 11:30818 (J;US)

CARBONYLS
Only for compounds of metals with carbonyl radicals.
Binding Energy
Comparison of thionitrosyl and nitrosyl bonding in dicarbonyl(eta^5-cyclopentadienyl)chromium complexes by gas-phase ultraviolet and x-ray photoelectron spectroscopy, 11:30266 (J;US)
Chemical Preparation
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_3Mo[^+\text{-}CH_3N(PF_2)_2]_2(\mu\text{-}PF_2)(\mu\text{-}Cl)Mo(CO)(PF_2NHCH_3)$, 11:30231 (J;US)
Chemical Reactions
Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986, 11:30236 (R;US)
Crystal Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_3Mo[^+\text{-}CH_3N(PF_2)_2]_2(\mu\text{-}PF_2)(\mu\text{-}Cl)Mo(CO)(PF_2NHCH_3)$, 11:30231 (J;US)
Molecular Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_3Mo[^+\text{-}CH_3N(PF_2)_2]_2(\mu\text{-}PF_2)(\mu\text{-}Cl)Mo(CO)(PF_2NHCH_3)$, 11:30231 (J;US)
Powders
Zero-field NMR of solid bis(μ-hydrido)decacarbonyltriosmium, 11:30203 (J;US)

CARBOXYLASE
Biochemistry
Reduced apparent photorespiration by the C_3-C_4 intermediate species, Moricandia arvensis and Panicum milioides, 11:30633 (J;US)
Enzyme Activity
2-(4-bromoacetamido)anilino-2-deoxypentitol 1,5-bisphosphate, a new affinity label for ribulose bisphosphate carboxylase/oxygenase from Rhodospirillum rubrum: determination of reaction parameters and characterization of an active site peptide, 11:30638 (J;US)
Histochemical technique: a general method for quantitative enzyme assays of single cell extracts with a time resolution of seconds and a reading precision of femtomoles, 11:30634 (J;US)
Labelling
2-(4-bromoacetamido)anilino-2-deoxypentitol 1,5-bisphosphate, a new affinity label for ribulose bisphosphate carboxylase/oxygenase from Rhodospirillum rubrum: determination of reaction parameters and characterization of an active site peptide, 11:30638 (J;US)
Radioimmunoassay
Pyruvate, Pi dikinase in bundle sheath strands as well as in mesophyll cells in maize leaves, 11:30669 (J;US)

CARCINOGEN SCREENING
Information Needs
Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 1. Extrapolation from animals to man, 11:30716 (R;US)

CARCINOGENESIS
Biochemistry
Biology Division progress report, October 1, 1984-September 30, 1985, 11:30720 (R;US)
Risk Assessment
Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 2. Toxicokinetics, 11:30717 (R;US)

CARIBOU
See DEER

CARS SPECTROSCOPY
See RAMAN SPECTROSCOPY

CASCADE REACTORS
Brayton Cycle
High efficiency heat transport and power conversion system for cascade, 11:31216 (J;US)
Breeding Blankets
Blanket optimization studies for cascade, 11:31162 (J;US)
Flow characteristics of the Cascade granular blanket, 11:31159 (J;US)
Breeding Pellets
Flow characteristics of the Cascade granular blanket, 11:31159 (J;US)
Design
Development of the cascade inertial-confinement-fusion reactor, 11:31226 (J;US)
Energy Efficiency
High efficiency heat transport and power conversion system for cascade, 11:31216 (J;US)
Heat Transfer
High efficiency heat transport and power conversion system for cascade, 11:31216 (J;US)
Inertial Confinement
Development of the cascade inertial-confinement-fusion reactor, 11:31226 (J;US)
Performance
Development of the cascade inertial-confinement-fusion reactor, 11:31226 (J;US)
Rankine Cycle
High efficiency heat transport and power conversion system for cascade, 11:31216 (J;US)

CASCADES (NUCLEAR)
See NUCLEAR CASCADES

CASINGS (WELL)
See WELL CASINGS

CASKS
See also SPENT FUEL CASKS
Criticality
US DOT Specification 6M radioactive fissile material package nuclear criticality safety re-evaluation, 11:30334 (R;US)
Design
Failure assessment techniques to ensure shipping container integrity, 11:30347 (R;US)
Failure Mode Analysis
Failure assessment techniques to ensure shipping container integrity, 11:30347 (R;US)
Impact Tests
Target hardness comparison to IAEA unyielding target, 11:30349 (R;US)
Performance Testing
Testing of the DHLW truck shipping cask, 11:30350 (R;US)
Remote Handling Equipment
Use of remote systems and automation in radioactive waste shipping and receiving, 11:29306 (R;US)
Specifications
US DOT Specification 6M radioactive fissile material package nuclear criticality safety re-evaluation, 11:30334 (R;US)

CASTING MOLDS
Cooling Systems
Microprocessor controller for mold heating and cooling. Final report, 11:30391 (R;US)

Heating Systems
Microprocessor controller for mold heating and cooling. Final report, 11:30391 (R;US)
CATALYSTS
Corrosion
High-pressure catalytic metal reactor in a simulated solar central receiver, 11:29513 (R;US)
Deactivation
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986 (Shell 324 m catalyst), 11:29162 (R;US)
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
CATHODES
Damage
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
Materials
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Molecule Collisions
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
CATION EXCHANGE CAPACITY
See CATIONS
ION EXCHANGE
CATIONS
Chemical Reactions
Chemiluminescence of CS_2I initiated by a thermal energy charge-transfer reaction with Ar^+, 11:30212 (J;US)
Chemiluminescence
Chemiluminescence of CS_2^+ initiated by a thermal energy charge-transfer reaction with Ar^+, 11:30212 (J;US)
Reduction
Surface-enhanced resonance Raman study of the photoreduction of methylviologen on a p-InP semiconductor electrode, 11:30285 (J;US)
CATS
Hemic Diseases
Myeloproliferative disease in a cat, 11:30673 (J;US)
CAVITY RESONATORS
Design
Monochromatic radio frequency accelerating cavity, 11:30403 (P;US)
CCD
See CHARGE-COUPLED DEVICES
CDF
Analog-to-Digital Converters
A large dynamic range charge amplifier ADC for the Fermilab collider detector facility, 11:30468 (J;US)
Array Processors
The Rabbit system: Low cost, high reliability front end electronics featuring 16 bit dynamic range, 11:30447 (J;US)
Data Acquisition Systems
The Rabbit system: Low cost, high reliability front end electronics featuring 16 bit dynamic range, 11:30447 (J;US)
Design
The Collider Detector at Fermilab (CDF), 11:30441 (J;US)
Drift Chambers
Radial wire drift chambers for CDF forward tracking, 11:30454 (J;US)
Fastbus System
A FASTBUS logic analyzer based on SLAC SNOOP diagnostic modules, 11:30464 (J;US)
FASTBUS cooling, 11:30466 (J;US)
FASTBUS rack alarms and limits, 11:30465 (J;US)
The FASTBUS Segment Extension as a crate coupling concept, 11:30463 (J;US)
Position Sensitive Detectors
A silicon vertex detector for CDF, 11:30446 (J;US)
Preamplifiers
A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers, 11:30471 (J;US)
Pulse Discriminators
A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers, 11:30471 (J;US)
Pulse Shapers
A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers, 11:30471 (J;US)
Si Semiconductor Detectors
A silicon vertex detector for CDF, 11:30446 (J;US)
CEA
See also CEA CADARACHE
Research Programs
French study and research program on water cooled reactor safety, 11:29757 (R;FR;In French)
CEA CADARACHE
Fuel Fabrication Plants
Cadarache - 20 years of plutonium fuels, 11:29805 (R;FR;In French)
CELL GROWTH (ANIMAL)
See ANIMAL CELLS
CELL GROWTH (PLANT)
See PLANT CELLS
CELLS (ANIMAL)
See ANIMAL CELLS
CELLS (BACTERIAL)
See BACTERIA
CELLS (PLANT)
See PLANT CELLS
CELLULOSE
Reducing Agents
Method of saccharifying cellulose, 11:30267 (P;US)
Saccharification
Method of saccharifying cellulose, 11:30267 (P;US)
CEMENTS
See also PORTLAND CEMENT
Compression Strength
Fixation of waste materials in grouts. Part II. An empirical equation for estimating compressive strength for grouts from different wastes, 11:29409 (R;US)
CENTRIFUGE ENRICHMENT PLANTS
Test Facilities
International Atomic Energy Agency UF_6 cascade header pipe test loop: safety assessment, 11:29453 (R;US)
CERAMIC MELTERS
Design
Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)
Operation
Operating radioactive liquid-fed ceramic melter system, 11:29411 (R;US)
CERAMICS
Absorption Spectroscopy
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Chemical Composition
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Chemical Preparation
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Chemical Vapor Deposition
Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration, 11:30130 (BA;US)
Computerized Tomography
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Corrosion
Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)
Elasticity
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

Emissivity
Screening ceramic materials for intense radiant heat applications, 11:30134 (BA;US)
Fabrication
Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration, 11:30130 (BA;US)
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Fastening
Metal-to-ceramic attachment device, 11:30110 (P;US)
Flexural Strength
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Fracture Properties
Silicon carbide whisker reinforced ceramic composites and method for making same, 11:30126 (P;US)
Gravimetric Analysis
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Hot Pressing
Hot isostatic pressing of ceramics, 11:30120 (R;FR;In French)
Silicon carbide whisker reinforced ceramic composites and method for making same, 11:30126 (P;US)
Microwave Heating
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
Nondestructive Testing
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Physical Radiation Effects
Materials problems for highly irradiated ICRH Launchers in fusion reactors, 11:31195 (J;US)
Reflectivity
Screening ceramic materials for intense radiant heat applications, 11:30134 (BA;US)
Thermal Diffusion
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
Thermal Expansion
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Thermodynamic Properties
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Uses
Screening ceramic materials for intense radiant heat applications, 11:30134 (BA;US)
X-Ray Fluorescence Analysis
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)

CERIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Radioecological Concentration
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Tissue Distribution
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)

CERMETS
Fabrication
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)
Microstructure
Processing and microstructural characterization of B_4C-Al cermets, 11:30132 (BA;US)

CESIUM
Auger Electron Spectroscopy
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Catalytic Effects
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Electron Diffraction
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Films
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Fission Products
Effects of time and other variables on fission product release rates, 11:29748 (R;US)
Harmonic Generation
Resonantly enhanced third-harmonic generation and multiphoton ionization in cesium vapor, 11:30811 (R;US)
Ion Emission
Cesium transpiration through a negative-ion forming electrode, 11:31266 (BA;US)
Ion Exchange
Vitrokele compositions: novel, high affinity, metal selective and regenerable media for the removal of radioactive metals from aqueous nuclear waste streams, 11:29357 (RA;US)
Ionization
Resonantly enhanced third-harmonic generation and multiphoton ionization in cesium vapor, 11:30811 (R;US)
Photoelectron Spectroscopy
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Volatility
Studies of the volatility of cesium and iodine, 11:30189 (RA;US)

CESIUM 137
Ecological Concentration
Plutonium and radiocesium in the water column of the Hudson River Estuary, 11:30619 (J;US)
Environmental Transport
Plutonium and radiocesium in the water column of the Hudson River Estuary, 11:30619 (J;US)
Leaching
Loss of weight, ^{60}Co, and ^{137}Cs from tree litter in three subsystems of a watershed, 11:30588 (J;US)
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)
Radioecological Concentration
Behavior of ^{137}Cs-tagged particles in a fescue meadow, 11:30701 (BA;XA)
Uptake
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)
Uptake of waste Sr 90 and Cs 137 by soil and vegetation, 11:30589 (J;US)

CESIUM COMPOUNDS
See also CESIUM FLUORIDES
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)

CESIUM FLUORIDES
Chemical Preparation
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Infrared Spectra
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Vibrational States
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)

CHALK RIVER NUCLEAR LABS
Intermediate-Level Radioactive Wastes
Transition from storage to permanent disposal of low- and intermediate-level wastes at the Chalk River Nuclear Laboratories, 11:29324 (RA;US)
Low-Level Radioactive Wastes
Transition from storage to permanent disposal of low- and intermediate-level wastes at the Chalk River Nuclear Laboratories, 11:29324 (RA;US)
CHALKS
See LIMESTONE
CHARGE-COUPLED DEVICES
Particle Tracks
Performance of radiation hard CCDs as tracking devices, 11:30475 (J;US)
Performance Testing
Performance of radiation hard CCDs as tracking devices, 11:30475 (J;US)
Radiation Hardening
Performance of radiation hard CCDs as tracking devices, 11:30475 (J;US)
CHARGED PARTICLE DETECTION
See also ALPHA DETECTION
ELECTRON DETECTION
ION DETECTION
PROTON DETECTION
High-Purity GE Detectors
High-purity germanium charged-particle detectors: A LBL-IUCF update, 11:30481 (J;NL)
CHARM PARTICLES
See also D MESONS
Particle Decay
Heavy flavour photoproduction and decay, 11:30850 (R;US)
Photoproduction
Heavy flavour photoproduction and decay, 11:30850 (R;US)
Search of prompt electrons in the NA14 photoproduction experiment at the CERN, 11:30836 (R;FR;In French)
CHARMONIUM
Particle Production
QCD prediction for charmonium production in anti pp collisions, 11:30878 (BA;US)
Photoproduction
Search of prompt electrons in the NA14 photoproduction experiment at the CERN, 11:30836 (R;FR;In French)
CHARPAK CHAMBERS
See MULTIWIRE PROPORTIONAL CHAMBERS
CHARS
Combustion
Combined cycle process with integrated gasification VEW-Coal Conversion Process, 11:29679 (R;SE)
Gasification
Active sites in char gasification. Quarterly technical progress report, 1 January-31 March 1986 (Lignite char and phenolic resin char), 11:29160 (R;US)
Sorptive Properties
Active sites in char gasification. Quarterly technical progress report, 1 January-31 March 1986 (Lignite char and phenolic resin char), 11:29160 (R;US)
Surface Area
Active sites in char gasification. Quarterly technical progress report, 1 January-31 March 1986 (Lignite char and phenolic resin char), 11:29160 (R;US)
CHEMICAL EXPLOSIONS
Wave Propagation
Gas explosion characterization, wave propagation (small-scale experiments). Vol. 1, 11:30509 (R;FR)
Gas explosion characterization, wave propagation (half-scale experiments). Vol. 2, 11:30510 (R;FR)
CHEMICAL EXPLOSIVES
See also NITROMETHANE
PETN
SHAPED CHARGES
Compression
Frequency shift measurement in shock-compressed materials, 11:30516 (P;US)
Density
Effects of physical properties on the initiation behaviors of heterogeneous high explosives, 11:30512 (R;US)
Detonations
Effects of physical properties on the initiation behaviors of heterogeneous high explosives, 11:30512 (R;US)
Simple blast model for structural design (TATB-based explosive PBX 9502 and HMX-based PBX 9501), 11:30513 (R;US)
Fabrication
Frequency shift measurement in shock-compressed materials, 11:30516 (P;US)
Grain Size
Effects of physical properties on the initiation behaviors of heterogeneous high explosives, 11:30512 (R;US)
Vibrational States
Frequency shift measurement in shock-compressed materials, 11:30516 (P;US)
CHEMICAL INDUSTRY
Energy Consumption
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report, 11:29980 (R;US)
CHEMICAL PLANTS
Modifications
Polyimide scale-up in a new facility, 11:30332 (R;US)
Risk Assessment
Evaluation of criteria for the application of systems-analytical methods for safety analyses of chemical plants, 11:30390 (R;DE;In German)
CHEMICAL REACTION KINETICS
See also COMBUSTION KINETICS
Research Programs
Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986, 11:30194 (R;US)
CHEMICAL REACTORS
See also RETORTS
Construction
High-pressure catalytic metal reactor in a simulated solar central receiver, 11:29513 (R;US)
Design
High-pressure catalytic metal reactor in a simulated solar central receiver, 11:29513 (R;US)
Performance Testing
Synthetic fuel gas from petroleum coke-performance in an industrial gasifier, 11:29238 (BA;US)
CHEMICAL VAPOR DEPOSITION
Technology Transfer
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
CHEMICAL WASTES
Political Aspects
Institutional and technical issues in the management of low-level mixed wastes, 11:29329 (RA;US)
Waste Disposal
Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual, 11:29450 (R;US)
Waste Management
Institutional and technical issues in the management of low-level mixed wastes, 11:29329 (RA;US)
CHEMICALS
See PLASTICIZERS
SURFACTANTS
CHEMISTRY
See also NUCLEAR CHEMISTRY
Meetings
Abstracts of the 26. Brazilian Congress on Chemistry, 11:30179 (R;BR;In Portuguese)
Research Programs
Chemistry research resource. Progress report, March 1986, 11:30175 (R;US)
CHERENKOV COUNTERS
Gain
Further measurements of electron transmission and avalanche gain in narrow lead glass tubing, 11:30461 (J;US)

Performance Testing
Ring imaging Cherenkov detector prototype results for E665 at Fermilab, 11:30456 (J;US)
Projection Spark Chambers
The recent operational performance of the CERN Omega Ring Imaging Cerenkov Detector, 11:30450 (J;US)
Shields
Further measurements of electron transmission and avalanche gain in narrow lead glass tubing, 11:30461 (J;US)

CHERENKOV DETECTORS
See CHERENKOV COUNTERS

CHEST
Phantoms
Tissue-equivalent torso phantom for calibration of transuranic-nuclide counting facilities, 11:30951 (R;US)

CHINA
Biomass Conversion Plants
Attempt of the biogas development and utilization. The introduction of the community biogas digesters and biogas distribution to each family in an agricultural research institute, 11:29468 (RA;DE)
Multiple utilization of the biomass, 11:29466 (RA;DE)
Primary approach to the engineering of centralized biogas supply system in Shanghai outskirts, 11:29467 (RA;DE)
Energy Policy
The history and future of China's oil shale industry, 11:29940 (BA;US)
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Oil Shale Deposits
The history and future of China's oil shale industry, 11:29940 (BA;US)
Oil Shale Industry
The history and future of China's oil shale industry, 11:29940 (BA;US)

CHINA CLAY
See KAOLIN

CHINESE HAMSTER OVARY CELLS
See CHO CELLS

CHLAMYDOMONAS
Metabolism
Fermentative metabolism of Chlamydomonas reinhardtii. II. Role of plastoquinone, 11:30653 (J;US)
Photochemical Reactions
Long-term endurance and selection studies in hydrogen and oxygen photoproduction by Chlamydomonas reinhardtii, 11:29457 (J;GB)

CHLOR-ALKALI INDUSTRY
See CHEMICAL INDUSTRY
CHLORINE
SODIUM CARBONATES

CHLORIDES
See also ALUMINIUM CHLORIDES
ANTIMONY CHLORIDES
CALCIUM CHLORIDES
NICKEL CHLORIDES
SILICON CHLORIDES
SODIUM CHLORIDES
STRONTIUM CHLORIDES
Solubility
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)
Thermodynamic Properties
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)

CHLORINATED AROMATIC HYDROCARBONS
Dissociation
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Gas Chromatography
Parallel capillary column gas chromatography in the determination of chlorinated pesticides and PCBs, 11:30186 (J;US)
Pyrolysis
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Quantitative Chemical Analysis
Parallel capillary column gas chromatography in the determination of chlorinated pesticides and PCBs, 11:30186 (J;US)
Sampling
Field sampling design and method of statistical analysis to define the areal extent of PCB contamination in low-level waste pond sediments, 11:29432 (RA;US)

CHLORINE
Chemical Reactions
Reactions of chlorine with liquid metals. 3. Bismuth, 11:30199 (J;US)
Dissociation
Optoacoustic detection of photodissociation and thermomolecular recombination in Cl_2, 11:30294 (J;US)
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Molecular Beams
Reactions of chlorine with liquid metals. 3. Bismuth, 11:30199 (J;US)
Photochemistry
Optoacoustic detection of photodissociation and thermomolecular recombination in Cl_2, 11:30294 (J;US)

CHLORINE CHLORIDES
See CHLORINE

CHLORINE COMPOUNDS
See also CHLORIDES
CHLORINE OXIDES
PERCHLORATES
Crystal Structure
Structure of trichloro(diethylenetriamine)gold(II), Au(dien)Cl_2, determined by single-crystal x-ray diffraction, Raman, and EXAFS spectroscopies: an EXAFS caveat, 11:30254 (J;US)
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)

CHLORINE LOGS
See NEUTRON-GAMMA LOGGING

CHLORINE OXIDES
Oxidation
Kinetics of one-electron transfer reactions involving ClO_2 and NO_2, 11:30204 (J;US)

CHLOROPHYLL
Absorption Spectroscopy
Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue, 11:30284 (J;US)
Complexes
Analysis of photosynthetic antenna function in a mutant of Arabidopsis thaliana (L.) lacking trans-hexadecenoic acid, 11:30630 (J;US)
Emission Spectroscopy
Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue, 11:30284 (J;US)

CHLOROPLASTS
Electron Transfer
Similarity of EPR Signal II/sub f/ rise and P-680$^+$ decay kinetics in Tris-washed chloroplast Photosystem II preparations as a function of pH, 11:30643 (J;NL)
Photosynthesis
Similarity of EPR Signal II/sub f/ rise and P-680$^+$ decay kinetics in Tris-washed chloroplast Photosystem II preparations as a function of pH, 11:30643 (J;NL)

CHO CELLS
Chromosomal Aberrations
Assignment of genes encoding metallothioneins I and II to Chinese hamster chromosomes 3. Evidence for the role of chromosome rearrangement in gene amplification, 11:30724 (J;US)

Strand Breaks
Assignment of genes encoding metallothioneins I and II to Chinese hamster chromosomes 3. Evidence for the role of chromosome rearrangement in gene amplification, 11:30724 (J;US)

CHOOZ B-1 REACTOR
See ARDENNES B-1 REACTOR

CHROMATID DELETIONS
See CHROMOSOMAL ABERRATIONS

CHROMIUM
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Environmental Transport
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)
Root Absorption
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)

CHROMIUM 51
Diffusion
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)
Isotope Effects
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)

CHROMIUM ALLOYS
See also CHROMIUM STEELS
STAINLESS STEELS
VANSTAR 7
Corrosion
Environmental effects on the properties of vanadium-base alloys, 11:31041 (RA;US)
Hydridation
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)
Materials Testing
Development of ferritic steels for reduced activation: the US program, 11:30081 (R;US)
Physical Radiation Effects
Effect of neutron irradiation on the tensile properties and microstructure of several vanadium alloys, 11:30085 (R;US)
Effects of irradiation on low activation ferritic alloys, 11:31062 (RA;US)
Tensile properties of helium-injected V-15Cr-5Ti after irradiation in EBR-II, 11:31059 (RA;US)
Tensile Properties
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)

CHROMIUM CARBIDES
Friction
Composition optimization of self-lubricating chromium carbide-based composite coatings for use to 760°C, 11:30091 (R;US)

CHROMIUM COMPLEXES
Binding Energy
Comparison of thionitrosyl and nitrosyl bonding in dicarbonyl(eta^5-cyclopentadienyl)chromium complexes by gas-phase ultraviolet and x-ray photoelectron spectroscopy, 11:30266 (J;US)
Chemical Preparation
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Chemical Reaction Kinetics
Kinetics and mechanisms of electron transfer between blue copper proteins and electronically excited chromium and ruthenium polypyridine complexes, 11:30292 (J;US)
Chemical Reactions
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Ion Exchange Chromatography
Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)
Spectrophotometry
Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)

CHROMIUM OXIDES
Crystal Defects
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)
Fracture Properties
Fracture toughness of $MgCr_2O_4$-ZrO_2 composites, 11:30133 (BA;US)
Self-Diffusion
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)

CHROMIUM STEELS
See also CHROMIUM-MOLYBDENUM STEELS
Phase Studies
Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30072 (R;FR;In French)
Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30076 (R;FR;In French)
Tensile Properties
Comparison of the tensile properties of 9-12% Cr. steels. (Pt. 1) data files, (Pt. 2) final report, 11:30094 (R;FR)
Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30072 (R;FR;In French)
Structure and tensile properties of ferro-martensitic alloys hardened by chi phase precipitation, 11:30076 (R;FR;In French)

CHROMIUM-MOLYBDENUM STEELS
See also ALLOY-HT-9
Corrosion
Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium, 11:31037 (RA;US)
Corrosion of type 316 stainless steel and 12 Cr-1 MoVW steel in flowing Pb-17 at. % Li, 11:31038 (RA;US)
Corrosion Fatigue
Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Cracks
Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)
Embrittlement
Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Fracture Mechanics
Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)
Fracture Properties
Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22}n/cm^2, 11:31060 (RA;US)
Rapid solidification of candidate ferritic steels, 11:31064 (RA;US)
Impact Strength
Effect of nickel content on the aging and irradiation response of impact properties of 9 Cr-1 MoVNb and 12 Cr-1 MoVW in the absence of internal helium effects, 11:31061 (RA;US)
Microstructure
Rapid solidification of candidate ferritic steels, 11:31064 (RA;US)
Physical Radiation Effects
Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22}n/cm^2, 11:31060 (RA;US)
Effect of nickel content on the aging and irradiation response of impact properties of 9 Cr-1 MoVNb and 12 Cr-1 MoVW in the absence of internal helium effects, 11:31061 (RA;US)
FFTF fusion irradiations - FFTF cycles 4-6, 11:31045 (RA;US)
Ion damage microstructures in a Fe-10Cr-6Mo-0.5Nb ferritic steel, 11:30087 (R;US)
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys (Candidate window materials for SIN beam stop), 11:30099 (R;US)

Reactor Materials
Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)
CHROMOSOMAL ABERRATIONS
See also SISTER CHROMATID EXCHANGES
Biological Indicators
Use of cytogenetic endpoints in human lymphocytes as indicators of exposure to genotoxicants, 11:30721 (BA;US)
CHROMOSOME ABERRATIONS
See CHROMOSOMAL ABERRATIONS
CHROMOSOME EXCHANGES
See CHROMOSOMAL ABERRATIONS
CHROMOSOME FRAGMENTS
See CHROMOSOMAL ABERRATIONS
CHROMOSOMES
Multivariate Analysis
Preparation and bivariate analysis of suspensions of human chromosomes, 11:30647 (J;US)
Sample Preparation
Preparation and bivariate analysis of suspensions of human chromosomes, 11:30647 (J;US)
CHRONIC RADIATION EFFECTS
See DELAYED RADIATION EFFECTS
CIRCUITS (ELECTRONIC)
See ELECTRONIC CIRCUITS
CIRCULAR POINT COLLECTORS
See PARABOLIC DISH COLLECTORS
CISTRONS
See GENES
CITIES
See URBAN AREAS
CITRIC ACID
Leaching
Release of organic reagents from solidified decontamination wastes, 11:29433 (RA;US)
CLAYS
See also BENTONITE
ILLITE
KAOLIN
SMECTITE
Mineralogy
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
CLIMATE MODELS
Design
Design and use of zonally-averaged climate models, 11:30519 (R;US)
CLIMATES
Summary report of the workshop on the interactions of climate and energy, 11:30520 (J;US)
Environmental Effects
Climatic change and the broad-scale distribution of terrestrial ecosystem complexes, 11:30572 (J;NL)
Seasonal Variations
Bioclimatic indicators for determining passive and low energy hybrid systems - case study, Saudi Arabia, 11:29585 (RA;US)
Variations
Climatic change and the broad-scale distribution of terrestrial ecosystem complexes, 11:30572 (J;NL)
CLIPPING CIRCUITS
See PULSE SHAPERS
CLOSTRIDIUM THERMOCELLUM
Reducing Agents
Method of saccharifying cellulose, 11:30267 (P;US)
Saccharification
Method of saccharifying cellulose, 11:30267 (P;US)
CLUSTERS (FUEL ELEMENTS)
See FUEL ELEMENT CLUSTERS
CLUSTERS (GALAXY)
See GALAXY CLUSTERS
CLUSTERS (ION)
See ION PAIRS
CO2 FLOODING
See CARBON DIOXIDE INJECTION
COAL
See also BLACK COAL
SUBBITUMINOUS COAL
Alkylation
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
Calorific Value
Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures, 11:29158 (R;US)
Chemical Composition
Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures, 11:29158 (R;US)
Coking
Contribution to the study of the mechanisms of coke formation, 11:29165 (R;XE;In French)
Combustion
Air blast type coal slurry fuel injector, 11:29224 (P;US)
Effect of energy feedback mechanisms on the oxidation rate of pulverized coal. Quarterly report, December 1, 1985-February 28, 1986, 11:29217 (R;US)
Modern pulverized coal combustion in Europe, 11:29220 (R;SE)
Study of the conditions of formation and emission of trace element pollutants from the combustion of coal in industrial fires, 11:29199 (R;XE)
Comminution
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
Computerized Tomography
Computed tomography of coals. Quarterly technical progress report No. 8, July 1-September 30, 1984, 11:29156 (R;US)
Consumption Rates
Annual outlook for US coal 1986, with projections to 1995 (USA; to 1995), 11:29226 (R;US)
Electron Spin Resonance
Electron spin mapping of coal molecular structure by ENDOR. Quarterly technical progress report, 11:29181 (R;US)
Exports
Annual outlook for US coal 1986, with projections to 1995 (USA; to 1995), 11:29226 (R;US)
Fluidized-Bed Combustion
Atmospheric FBC and CFBC - the American approach, 11:29221 (R;SE)
Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
Pressurized-fluidized bed combustion (PFBC) - coal power for the future, 11:29223 (R;SE)
Progress in circulating fluidized bed firing for steam generation and use of low value fuels and coals, 11:29218 (R;FR;In German)
Inventories
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
Maritime Transport
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Market
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Mass Spectra
New mass spectral methods for coal characterization. Final report, July 15, 1982-September 14, 1985 (Oxidized coal and coal oxidation products; Tandem MS/MS methodology), 11:29174 (R;US)
Molecular Structure
Electron spin mapping of coal molecular structure by ENDOR. Quarterly technical progress report, 11:29181 (R;US)
NMR Spectra
Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985, 11:29177 (R;US)
Oxidation
New mass spectral methods for coal characterization. Final report, July 15, 1982-September 14, 1985 (Oxidized coal and

coal oxidation products; Tandem MS/MS methodology), 11:29174 (R;US)

Prices
Annual outlook for US coal 1986, with projections to 1995 (USA; to 1995), 11:29226 (R;US)

Production
Annual outlook for US coal 1986, with projections to 1995 (USA; to 1995), 11:29226 (R;US)

Pyrolysis
Effect of energy feedback mechanisms on the oxidation rate of pulverized coal. Quarterly report, December 1, 1985-February 28, 1986, 11:29217 (R;US)
Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures, 11:29158 (R;US)

Research Programs
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

Solids Flow
Fundamentals of bulk solids flow (369 references), 11:29211 (R;GB)

Solvent Extraction
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)

Stockpiles
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)

Structural Chemical Analysis
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)
New mass spectral methods for coal characterization. Final report, July 15, 1982-September 14, 1985 (Oxidized coal and coal oxidation products; Tandem MS/MS methodology), 11:29174 (R;US)
Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985, 11:29177 (R;US)

Supercritical Gas Extraction
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)

Swelling
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)

Trade
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)

Washing
Coal cleaning as an acid rain mitigation strategy: an in-depth examination, 11:29214 (J;US)

COAL CHEMICALS
See COAL EXTRACTS

COAL DEPOSITS
See also COAL SEAMS

Seismic Surveys
Seismic surveys at Blackburn, Buller coal fields, New Zealand, 11:29202 (R;NZ)

COAL EXTRACTS

Fractionation
Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)

Infrared Spectra
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)
Linkages and aromatic clusters in a bituminous coal. Quarterly technical progress report No. 2, December 1, 1985-February 28, 1986, 11:29184 (R;US)

NMR Spectra
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)

COAL FINES

Flotation
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)

Particle Size
Development and demonstration of a static tube flotation system for producing superclean coal. Technical progress report, 2nd quarterly (ending March 31, 1986), 11:29208 (R;US)
Improving the stability of coal slurries. Quarterly and half-yearly report, September 15-December 15, 1985 and September 15, 1985-March 15, 1986, 11:29206 (R;US)
Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)

COAL GASIFICATION

Reaction Kinetics
Computed tomography of coals. Quarterly technical progress report No. 8, July 1-September 30, 1984, 11:29156 (R;US)

Reviews
Gasification - general overview, 11:29166 (R;SE)

Technology Assessment
Gasification - general overview, 11:29166 (R;SE)

COAL GASIFICATION PLANTS

Air Quality
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986 (Lurgi Process), 11:29198 (R;US)

By-Products
[Great Plains Coal Gasification Associates]. Quarterly technical progress report (Lurgi Process), 11:29155 (R;US)

Design
Great Plains Gasification Project process stream design data (Lurgi Process), 11:29157 (R;US)

Environmental Effects
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986 (Lurgi Process), 11:29198 (R;US)

Fuel Consumption
[Great Plains Coal Gasification Associates]. Quarterly technical progress report (Lurgi Process), 11:29155 (R;US)

Maintenance
[Great Plains Coal Gasification Associates]. Quarterly technical progress report (Lurgi Process), 11:29155 (R;US)

Materials
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

Materials Testing
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

Modifications
Great Plains Coal Gasification Plant start-up and modification report (Lurgi Process), 11:29154 (R;US)

Operation
[Great Plains Coal Gasification Associates]. Quarterly technical progress report (Lurgi Process), 11:29155 (R;US)

Pollution Control
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986 (Lurgi Process), 11:29198 (R;US)

Pressure Vessels
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

Safety
[Great Plains Coal Gasification Associates]. Quarterly technical progress report (Lurgi Process), 11:29155 (R;US)

Start-Up
Great Plains Coal Gasification Plant start-up and modification report (Lurgi Process), 11:29154 (R;US)

Valves
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

COAL INDUSTRY
Energy Consumption
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume IA. Appendices with 1975 data. Final report, 11:29946 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report, 11:29980 (R;US)
Forecasting
Annual outlook for US coal 1986, with projections to 1995 (USA; to 1995), 11:29226 (R;US)
COAL LIQUEFACTION
See also SUPERCRITICAL GAS EXTRACTION
Catalysts
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
Chemistry
Improved coal conversion in CO/water systems. Quarterly report No. 5, September 4, 1985-December 3, 1985, 11:29163 (R;US)
Organic Solvents
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
Temperature Effects
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
COAL LIQUEFACTION PLANTS
Materials
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Materials Testing
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Valves
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
COAL LIQUIDS
Fractionation
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Health Hazards
Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences, 11:30696 (R;US)
Hydrogenation
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
Mass Spectra
New mass spectral methods for coal characterization. Final report, July 15, 1982-September 14, 1985, 11:29174 (R;US)
Quantitative Chemical Analysis
Chromatographic chemical characterization of solvent refined coal I and II, 11:30725 (J;DE)
Technology Assessment
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Teratogenesis
Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences, 11:30696 (R;US)
Toxicity
Chromatographic chemical characterization of solvent refined coal I and II, 11:30725 (J;DE)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
COAL MINES
Abandoned Sites
Coal industry perspectives on nonpoint source pollution, 11:29191 (RA;US)
Permit Applications
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
Site Selection
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
COAL MINING
Abandoned Sites
Factors and treatment of abandoned acid mine lands for controlling nonpoint source pollution, 11:29192 (RA;US)
Environmental Effects
Effect of distance on the preservation value of water quality, 11:29907 (J;US)
COAL PREPARATION
Cost
Physical coal beneficiation and electricity costs, 11:29210 (R;GB)
COAL PREPARATION PLANTS
Materials
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Materials Testing
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
COAL RESERVES
Leasing
Economic assessment of effects of royalties, severance taxes, and diligent development requirements on coal production, prices, and consumer costs. Draft final report, 11:29228 (R;US)
COAL SEAMS
Hydraulic Fracturing
Quasi-static and dynamic arbitrary fracture propagation in jointed rock, 11:29252 (R;US)
COAL TAR OILS
See also NAPHTHA
Inventories
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Production
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
COAL-DERIVED LIQUIDS
See COAL LIQUIDS
COAL-FIRED GAS TURBINES
Previous to February 1980 this concept was indexed to GAS TURBINES.
Turbine Blades
Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)
COAL-OIL MIXTURES
See COAL
FUEL OILS
FUEL SLURRIES
COASTAL REGIONS
Atmospheric Circulation
Wind direction meander at a coastal site during onshore flows, 11:30521 (J;US)
COBALT
Absorption Spectroscopy
Determination of cobalt in samples containing cobalt and tungsten carbide by electrothermal atomic absorption spectrometry, 11:30548 (J;US)
Environmental Transport
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)
Ion Exchange
Vitrokele compositions: novel, high affinity, metal selective and regenerable media for the removal of radioactive metals from aqueous nuclear waste streams, 11:29357 (RA;US)
Root Absorption
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)
COBALT 60
Leaching
Loss of weight, ^{60}Co, and ^{137}Cs from tree litter in three subsystems of a watershed, 11:30588 (J;US)
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)

Uptake
Experimental investigation of cobalt-60 accumulation and elimination in Cyprinus carpio (L.), 11:30690 (R;FR;In French)

COBALT ALLOYS
See also COBALT BASE ALLOYS
Corrosion Resistance
Research on erosion and corrosion of cobalt-free materials, 11:30093 (R;FR;In German)

COBALT BASE ALLOYS
Corrosion Resistance
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
Materials Testing
FY 1984 and FY 1985 geochemistry and materials studies in support of the Magma Energy Extraction Program, 11:29639 (R;US)
Oxidation
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
Protective Coatings
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)

COBALT COMPLEXES
Chemical Preparation
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Chemical Reactions
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Photochemical Reactions
Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study, 11:30296 (J;GB)

COBALT OXIDES
Impurities
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)

COBALT SULFATES
Phase Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

COGENERATION
Prior to November 1980, this concept was indexed to CO-GENERATION.
See COGENERATION
Comparative Evaluations
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)
Control Systems
Electrical control of a cogeneration set in parallel mains operation or in stand-by operation, 11:29480 (RA;DE)
Economic Analysis
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)
Electric Utilities
Commercial aspects of CHP and private generation: an Electricity Supply Industry viewpoint, 11:29677 (R;GB)
United Kingdom
Commercial aspects of CHP and private generation: an Electricity Supply Industry viewpoint, 11:29677 (R;GB)

COHERENT ANTI-STOKES RAMAN SPECTROSCOPY
See RAMAN SPECTROSCOPY

COILS (MAGNETIC)
See MAGNET COILS

COKE
Gasification
Synthetic fuel gas from petroleum coke-performance in an industrial gasifier, 11:29238 (BA;US)
Texture
Contribution to the study of the mechanisms of coke formation, 11:29165 (R;XE;In French)

COKE OVENS
Computerized Control Systems
Developments in control systems for the thermal regime of batteries and coking of coal, 11:29164 (R;XE;In French)

COLD PLASMA
Plasma Diagnostics
Low-temperature plasma near a tokamak reactor limiter, 11:30987 (J;US)

COLD STORAGE
Feasibility Studies
Attractive economics of thermal storage in new buildings, 11:29976 (RA;US)
Payback Period
Attractive economics of thermal storage in new buildings, 11:29976 (RA;US)

COLLECTRONS
See SELF-POWERED NEUTRON DETECTORS

COLLEGES
See EDUCATIONAL FACILITIES

COLLIDER DETECTOR AT FERMILAB
See CDF

COLLIERIES
See COAL MINES

COLLISIONAL HEATING
Ion Beam Targets
Collisonal pumping for the production of intense spin-polarized neutral BEAMS: target considerations, 11:31219 (J;US)
Polarized Beams
Collisonal pumping for the production of intense spin-polarized neutral BEAMS: target considerations, 11:31219 (J;US)

COLLISIONAL PLASMA
Wave Propagation
Numerics for the simulation of electromagnetic-field propagation in nonionized and plasma media, 11:30975 (R;US)

COLLISIONLESS PLASMA
Wave Propagation
Numerics for the simulation of electromagnetic-field propagation in nonionized and plasma media, 11:30975 (R;US)

COLLOIDS
See also FOAMS
Improving the stability of coal slurries. Quarterly and half-yearly report, September 15-December 15, 1985 and September 15, 1985-March 15, 1986, 11:29206 (R;US)
Optical Properties
Enhanced photoredox chemistry in quantized semiconductor colloids, 11:30289 (J;US)
Photolysis
Photoelectrochemistry in particulate systems. 3. Phototransformations in the colloidal TiO_2-thiocyanate system, 11:30173 (J;US)

COLOMBIA
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)

COLUMBIA RIVER
Anadromous Fishes
Monitoring of downstream salmon and steelhead at federal hydroelectric facilities. Annual report 1985, 11:29493 (R;US)
Dams
Smolt passage behavior and flow-net relationship in the forebay of John Day Dam. Final report 1985, 11:29494 (R;US)

COLUMBIUM
See NIOBIUM

COLUMNS (MECHANICAL)
See MECHANICAL STRUCTURES

COMBINED GAS AND STEAM CYCLE POWER PLANTS
See COMBINED-CYCLE POWER PLANTS

COMBINED STEAM-POWER GENERATION
See COGENERATION

COMBINED-CYCLE POWER PLANTS
Prior to March, 1976, the descriptors COMBINED CYCLES and FOSSIL-FUEL POWER PLANTS or THERMAL POWER PLANTS were used for indexing this concept.
Cogeneration
Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses, 11:29215 (R;US)
Comparative Evaluations
Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses, 11:29215 (R;US)
Demonstration Plants
Cool water Integrated Coal Gasification Combined Cycle project: status and results, 11:29680 (R;SE)
Design
Combined cycle process with integrated gasification VEW-Coal Conversion Process, 11:29679 (R;SE)
Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses, 11:29215 (R;US)
Economics
Cool water Integrated Coal Gasification Combined Cycle project: status and results, 11:29680 (R;SE)
Efficiency
Combined cycle process with integrated gasification VEW-Coal Conversion Process, 11:29679 (R;SE)
Cool water Integrated Coal Gasification Combined Cycle project: status and results, 11:29680 (R;SE)
Engineering
Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses, 11:29215 (R;US)
Performance
Generic studies of advanced fluid bed air heater technology. Topical report Number 1. Task 1: System configuration (bubbling beds); Task 5: Bed and heat exchanger losses, 11:29215 (R;US)
COMBUSTION
See also FLUIDIZED-BED COMBUSTION
Comparative Evaluations
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Correlations
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Environmental Impacts
Modern pulverized coal combustion in Europe, 11:29220 (R;SE)
Mathematical Models
Effect of energy feedback mechanisms on the oxidation rate of pulverized coal. Quarterly report, December 1, 1985-February 28, 1986, 11:29217 (R;US)
Hydrogen:air:steam flammability limits and combustion characteristics at intermediate scale, 11:29861 (R;US)
COMBUSTION CHAMBERS
Cold Pressing
Evaluation of cold isostatic pressing for high pressure thrust chambers, 11:30101 (R;JP)
Computerized Simulation
Basic computer code for industrial burner designs. Part 1: capability test in isothermal swirling flows, 11:30326 (RA;JP)
Design
Basic computer code for industrial burner designs. Part 1: capability test in isothermal swirling flows, 11:30326 (RA;JP)
Performance Testing
Evaluation of cold isostatic pressing for high pressure thrust chambers, 11:30101 (R;JP)
Powder Metallurgy
Evaluation of cold isostatic pressing for high pressure thrust chambers, 11:30101 (R;JP)
COMBUSTION KINETICS
Algorithms
Investigation of chemically-reacting supersonic internal flows. Progress report, 11:30034 (R;US)
Computerized Simulation
Numerical simulation method for combustion in an oxyhydrogen rocket motor, 11:30281 (RA;JP)
Numerical Solution
Numerical simulation method for combustion in an oxyhydrogen rocket motor, 11:30281 (RA;JP)
Supersonic Flow
Investigation of chemically-reacting supersonic internal flows. Progress report, 11:30034 (R;US)
COMBUSTION PRODUCTS
Corrosive Effects
Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)
Leaching
Study of the conditions of formation and emission of trace element pollutants from the combustion of coal in industrial fires, 11:29199 (R;XE)
COMBUSTORS
See also FLUIDIZED-BED COMBUSTORS
Comparative Evaluations
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)
Economic Analysis
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)
COMMERCIAL BUILDINGS
Design
Design of energy-responsive commercial buildings, 11:30005 (RA;US)
Energy Conservation
Measures for energy conservation in buildings: Singapore experience, 11:30011 (RA;US)
Energy Consumption
Design of energy-responsive commercial buildings, 11:30005 (RA;US)
Results from the Non-Residential Buildings Energy Consumption Survey (NBECS), 11:29966 (RA;US)
Power Demand
Results from the Non-Residential Buildings Energy Consumption Survey (NBECS), 11:29966 (RA;US)
Solar Water Heating
Solar water heating - recent trends, cost, and performance, 11:29592 (RA;US)
Thermal Insulation
Thermophysical properties of industrial insulators, 11:30021 (J;GB)
COMMERCIAL SECTOR
Energy Consumption
Commercial sector energy consumption in Taiwan, R.O.C., 11:29958 (RA;US)
Data on energy use in the commercial sector of the Federal Republic of Germany, 11:29961 (RA;US)
Directions in commercial sector electricity forecasting, 11:29972 (RA;US)
Electricity use in the US commercial sector 1960-2000, 11:29959 (RA;US)
Energy use in Norway's commercial sector (1965-1983), 11:29950 (RA;US)
Energy use in the commercial sector: the Norwegian energy consumption system and physical/technical energy models, 11:29968 (RA;US)
Forecasting at Sierra Pacific Power Company, 11:29973 (RA;US)
Overview of electricity use in the United States service sector, 11:29960 (RA;US)
Utility perspective on commercial sector markets, 11:29970 (RA;US)

Energy Models
Directions in commercial sector electricity forecasting, 11:29972 (RA;US)
Forecasting at Sierra Pacific Power Company, 11:29973 (RA;US)
Power Demand
Electricity use in the US commercial sector 1960-2000, 11:29959 (RA;US)
Overview of electricity use in the United States service sector, 11:29960 (RA;US)

COMMUNITIES
Biomass Conversion Plants
Community biogas programmes of Gram Vikas, 11:29472 (RA;DE)

COMPACT TORUS
Prior to October 1982, this concept was indexed to THERMONUCLEAR DEVICES or to a particular experiment if known, e.g., REVERSE-FIELD PINCH.
Efficiency
A high efficiency I.C.F. driver employing magnetically confined plasma rings, 11:31225 (J;US)
Inertial Confinement
A high efficiency I.C.F. driver employing magnetically confined plasma rings, 11:31225 (J;US)
Plasma Rings
A high efficiency I.C.F. driver employing magnetically confined plasma rings, 11:31225 (J;US)

COMPOSITE MATERIALS
See also CERMETS
Chemical Vapor Deposition
Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration, 11:30130 (BA;US)
Fabrication
Chemical vapor infiltration of fiber-reinforced ceramic composites, 11:30143 (R;US)
Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration, 11:30130 (BA;US)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Mechanical Properties
Specimen geometry effects on graphite/PMR-15 composites during thermo-oxidative aging, 11:30144 (R;US)
Sample Preparation
Specimen geometry effects on graphite/PMR-15 composites during thermo-oxidative aging, 11:30144 (R;US)
Thermal Testing
Specimen geometry effects on graphite/PMR-15 composites during thermo-oxidative aging, 11:30144 (R;US)
Tomography
Use of a medical scanner for non-destructive control of composite materials, 11:30382 (R;FR;In French)

COMPOUND NUCLEI
Lifetime
X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus, 11:30912 (R;FR;In French)

COMPOUND-NUCLEUS REACTIONS
X-Ray Spectroscopy
X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus, 11:30912 (R;FR;In French)

COMPOUNDS (INORGANIC)
See INORGANIC COMPOUNDS

COMPOUNDS (ORGANIC)
See ORGANIC COMPOUNDS

COMPRESSED GASES
Hazards
Safety implications associated with in-plant pressurized gas storage and distribution systems, 11:29872 (J;US)
Safety
Safety implications associated with in-plant pressurized gas storage and distribution systems, 11:29872 (J;US)

COMPTON SCATTERING TOMOGRAPHY
Tomography based on the detection by a gamma camera of the 90° Compton scattering of a planar gamma beam produced by an external source.
High-Purity GE Detectors
A new Compton densitometer for measuring pulmonary edema, 11:30665 (J;US)

COMPTON SPECTROMETERS
Design
Influence of electron momentum on the shape of backscatter peaks in gamma-ray spectrometers, 11:30483 (J;NL)
Efficiency
Influence of electron momentum on the shape of backscatter peaks in gamma-ray spectrometers, 11:30483 (J;NL)

COMPUTED TOMOGRAPHY
See COMPUTERIZED TOMOGRAPHY

COMPUTER CALCULATIONS
Methods, not results.
Multiprocessor sparse L/U decomposition with controlled fill-in. Final report, 11:31280 (R;US)

COMPUTER CODES
Computer codes are indexed by their initial letter and CODES, e.g., A CODES. If the code name begins with a number the code is indexed to NUMBER CODES.
See also A CODES
E CODES
G CODES
M CODES
O CODES
R CODES
S CODES
A Codes
Transmission of fast neutrons through an iron sphere, 11:31091 (J;US)
C Codes
Evaluation of blast designs for in situ oil shale retorting, 11:29262 (BA;US)
Rock motion modeling of oil shale cratering experiments, 11:29264 (BA;US)
Certification
Analysis of the certification process of computer programs used in a nuclear power plant, using the management systems approach, 11:29846 (R;US)
D Codes
Diffusion approximation for modeling of 3-D radiation distributions, 11:30948 (R;US)
Evaluation of blast designs for in situ oil shale retorting, 11:29262 (BA;US)
Design
Quantification of roadway fugitive dust at a large Midwestern steel mill, 11:30533 (RA;US)
Failures
Research in computer science. semiannual report, 11:31283 (R;US)
I Codes
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
J Codes
An assessment of tritium breeding requirements based on the tritium fuel cycle, 11:31088 (J;US)
R Codes
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
Sputtering performance of a pumped limiter for an ignition tokamak, 11:31090 (J;US)
T Codes
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
Overview of the Fusion Power Demonstration study, 11:31129 (J;US)
Plasma heating systems module for TMRSC, 11:31211 (J;US)
Tandem Mirror Reactor Systems Code (TMRSC), 11:31117 (J;US)
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)

V Codes
Computational methodology for the Oak Ridge Research Reactor (ORR) and Bulk Shielding Reactor (BSR): the VICTORR input processing code for the BOLD VENTURE system. Volume 2, 11:29821 (R;US)
Transmission of fast neutrons through an iron sphere, 11:31091 (J;US)
COMPUTER GRAPHICS
Computer Codes
ARC-OLOGY via TELL-A-GRAF, 11:31289 (R;US)
COMPUTER NETWORKS
Electronic mail at ANL. Revision, 11:31276 (R;US)
Computer Codes
MVUSRS utility reference manual, 11:31287 (R;US)
Configuration
Partitioning problems in parallel, pipelined and distributed computing. Final Report, 11:31282 (R;US)
Installation
Guide to sharing personal computer resources via local area networks, 11:31277 (R;US)
Management
Guide to sharing personal computer resources via local area networks, 11:31277 (R;US)
Manuals
MVUSRS utility reference manual, 11:31287 (R;US)
COMPUTER PROGRAMS
See COMPUTER CODES
COMPUTERIZED SIMULATION
Research Programs
Development of computational fluid dynamics at NASA Ames Research Center, 11:30381 (RA;JP)
Reviews
Development of computational fluid dynamics at NASA Ames Research Center, 11:30381 (RA;JP)
COMPUTERIZED TOMOGRAPHY
An imaging technique in which transmission measurements of a narrow beam of rays, photons, or particles made at several different angles around an object may be used with a computer program to obtain a clear image of one plane
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
COMPUTERS
See also DENELCOR COMPUTERS
UNIVAC COMPUTERS
Configuration
Research in computer science. semiannual report, 11:31283 (R;US)
CONCENTRATOR SOLAR CELLS
Prior to July, 1979 SOLAR CELLS or specific solar cells descriptors and SOLAR CONCENTRATORS were used to index this concept.
Fabrication
Photovoltaic concentrator research status, 11:29611 (BA;US)
Research Programs
Photovoltaic concentrator research status, 11:29611 (BA;US)
CONCRETES
See also PRESTRESSED CONCRETE
REINFORCED CONCRETE
Decontamination
Volume reduction of contaminated concrete shield slabs through surface removal (Scabbling), 11:29360 (RA;US)
Fluid-Structure Interactions
Independent analysis of selected core-concrete interaction and fission product release experiments with CORCON-MOD2 and VANESA, 11:29829 (R;US)
CONDENSERS (VAPOR)
See VAPOR CONDENSERS
CONFERENCES
See MEETINGS
CONSOLIDATED FUEL REPROCESSING PROGRAM
Consolidated Fuel Reprocessing Program. Progress report, October 1-December 31, 1985, 11:29296 (R;US)
CONSTRUCTION INDUSTRY
Demonstration Programs
Energy economical pilot projects in building industry, 11:29997 (R;FI;In Finnish)
Energy Conservation
Energy economical pilot projects in building industry, 11:29997 (R;FI;In Finnish)
Energy Consumption
1975, 1976 Energy Consumption Data Base for the Industrial Sector. Volume 3. Computer-related documentation. Final report, 11:29948 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report, 11:29979 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
Technology Transfer
Strategy for accelerating the use of energy-conserving building technologies, 11:30019 (J;US)
CONTACT RADIOTHERAPY
See RADIOTHERAPY
CONTACTS (ELECTRIC)
See ELECTRIC CONTACTS
CONTAINERS
See also CAPSULES
CASKS
PRESSURE VESSELS
Corrosion
Corrosion behaviour of container materials for geological disposal of high level radioactive waste, 11:30092 (R;FR)
Corrosion Resistance
Corrosion studies on HLW steel containers, 11:29316 (R;FR)
Design
Scientific basis for nuclear waste management IX, 11:29420 (B;US)
Electric Conductivity
Electrically conductive containment vessel for molten aluminum, 11:30112 (P;US)
Fabrication
Electrically conductive containment vessel for molten aluminum, 11:30112 (P;US)
Impact Tests
Drop testing at the Oak Ridge National Laboratory (TRUPACT-I and a TMI-2 defueling canister), 11:30333 (R;US)
Materials Testing
Experiences in development, qualification, and use of concrete high-integrity containers in commercial disposal of radioactive wastes, 11:29359 (RA;US)
Matrix Materials
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
CONTAINMENT BUILDINGS
Chemical Radiation Effects
The effectiveness of building wall boration in controlling the neutron responses in a fusion facility, 11:31242 (J;US)
Fluid-Structure Interactions
Independent analysis of selected core-concrete interaction and fission product release experiments with CORCON-MOD2 and VANESA, 11:29829 (R;US)
Physical Radiation Effects
The effectiveness of building wall boration in controlling the neutron responses in a fusion facility, 11:31242 (J;US)
Protective Coatings
The effectiveness of building wall boration in controlling the neutron responses in a fusion facility, 11:31242 (J;US)
Surface Coating
The effectiveness of building wall boration in controlling the neutron responses in a fusion facility, 11:31242 (J;US)
CONTAINMENT SYSTEMS
Design
Fission gas detection system, 11:29875 (P;US)
CONTINENTAL SHELF
Geochemistry
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)
Petroleum Deposits
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)

Petroleum Geology
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)
CONTROL EQUIPMENT
Performance Testing
Initial test results and test plan for differential temperature controllers used in solar energy systems, 11:29600 (R;US)
CONTROL THEORY
Zero models and pole models for multivariable systems, 11:30960 (R;US)
CONVECTION
Instability
Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
CONVEYORS
See also BELT CONVEYORS
Design
Design considerations to avoid common fly ash conveying problems, 11:29740 (RA;US)
COOKING
See FOOD PROCESSING
COOLANTS
See also specific coolant materials.
Comparative Evaluations
A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor, 11:31222 (J;US)
Fragmentation
Fragmentation of suddenly heated liquids in ICF reactors, 11:31189 (J;US)
Heating
Fragmentation of suddenly heated liquids in ICF reactors, 11:31189 (J;US)
Materials Testing
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
COOLERS
See HEAT EXCHANGERS
COOLING SYSTEM (REACTOR)
See REACTOR COOLING SYSTEMS
COOLING SYSTEMS
See also REACTOR COOLING SYSTEMS
THERMONUCLEAR REACTOR COOLING SYSTEMS
Biological Fouling
Fouling control in cooling systems using brackish water, 11:29681 (R;FI;In Finnish)
Computerized Control Systems
Microprocessor controller for mold heating and cooling. Final report, 11:30391 (R;US)
Failures
Temperature history for canistered fuel lag storage areas during the loss of cooling air at the receiving and handling building of the MRS Facility, 11:29302 (R;US)
COPPER
Chemical Reaction Kinetics
Kinetics and mechanisms of electron transfer between blue copper proteins and electronically excited chromium and ruthenium polypyridine complexes, 11:30292 (J;US)
Collisions
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
Environmental Transport
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Physical Radiation Effects
Effects of neutron irradiation at 450°C and 16 dpa on the properties of various commercial copper alloys, 11:31036 (RA;US)
Self-Diffusion
Silver-tracer diffusion in Cu_2O, 11:30230 (J;GB)
Uptake
Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
COPPER 64
Diffusion
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)
Diffusion and point defects in Cu_2O, 11:30139 (J;GB)
Isotope Effects
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)
Diffusion and point defects in Cu_2O, 11:30139 (J;GB)
COPPER ALLOYS
See also COPPER BASE ALLOYS
Materials Testing
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
Microstructure
Microstructural examination of pure copper and three copper alloys irradiated in FFTF, 11:30097 (R;US)
Physical Radiation Effects
Microstructural examination of pure copper and three copper alloys irradiated in FFTF, 11:30097 (R;US)
Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
COPPER BASE ALLOYS
Microstructure
Microstructural examination of pure copper and three copper alloys irradiated in FFTF, 11:30097 (R;US)
Physical Radiation Effects
Effects of neutron irradiation at 450°C and 16 dpa on the properties of various commercial copper alloys, 11:31036 (RA;US)
Microstructural examination of pure copper and three copper alloys irradiated in FFTF, 11:30097 (R;US)
Response of selected high strength high conductivity copper alloys to simulated fusion irradiation and temperature conditions, 11:31035 (RA;US)
COPPER COMPLEXES
Absorption Spectroscopy
Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue, 11:30284 (J;US)
Emission Spectroscopy
Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue, 11:30284 (J;US)
COPPER COMPOUNDS
See also COPPER OXIDES
COPPER SELENIDES
Polymerization
Raman spectroscopy of polymers of metal protoporphyrin free acids on metal electrodes, 11:30283 (J;US)
COPPER OXIDES
Crystal Defects
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)
Point Defects
Diffusion and point defects in Cu_2O, 11:30139 (J;GB)
Self-Diffusion
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)
Diffusion and point defects in Cu_2O, 11:30139 (J;GB)
Vacancies
Silver-tracer diffusion in Cu_2O, 11:30230 (J;GB)
COPPER SELENIDE SOLAR CELLS
Fabrication
Photoluminescence studies of CuIn-Se_2 thin films and crystals, 11:29552 (BA;US)
Status of photovoltaics R & D at SERI, 11:29548 (BA;US)
Thin-film tandem solar cells based on $CuInSe_2$, 11:29550 (BA;US)
Physical Radiation Effects
Photon radiation effects on CdS/CuInSe2 thin film solar cells, 11:29533 (RA;US)
COPPER SELENIDES
Crystal Defects
Photoluminescence studies of CuIn-Se_2 thin films and crystals, 11:29552 (BA;US)

Photoluminescence
Photoluminescence studies of CuIn-Se$_2$ thin films and crystals, 11:29552 (BA;US)
COPPER VAPOR LASERS
See GAS LASERS
CORALS
Population Dynamics
Need to test assumptions of models: the population biology of sessile invertebrates on coral reefs, 11:30602 (RA;US)
CORES (REACTOR)
See REACTOR CORES
CORIUM
Fluid-Structure Interactions
Independent analysis of selected core-concrete interaction and fission product release experiments with CORCON-MOD2 and VANESA, 11:29829 (R;US)
CORN (MAIZE)
See MAIZE
CORN STOVER
See AGRICULTURAL WASTES
MAIZE
CORROSION
See also STRESS CORROSION
Acoustic Monitoring
Use of an acoustic borehole televiewer to investigate casing corrosion in geothermal wells, 11:29623 (R;US)
Monitoring
High resolution in situ ultrasonic corrosion monitor, 11:29807 (P;US)
Ultrasonic Testing
High resolution in situ ultrasonic corrosion monitor, 11:29807 (P;US)
CORROSION RESISTANT ALLOYS
See also STAINLESS STEELS
Corrosion Resistance
Research on erosion and corrosion of cobalt-free materials, 11:30093 (R;FR;In German)
COSMIC GAMMA BURSTS
Gamma Spectra
Soft-spectrum gamma-ray bursts, 11:30787 (RA;US)
COSMIC GAMMA SOURCES
Reviews
Point source of very high energy gamma ray, 11:30771 (RA;JP)
COSMIC PARTICLES
See COSMIC RADIATION
COSMIC PROTONS
Prior to July, 1975 information was indexed to PROTONS.
Cosmic Ray Propagation
Some topics in cosmic rays, 11:30780 (RA;JP)
COSMIC RADIATION
From sources other than the sun; not for SOLAR RADIATION.
See also COSMIC PROTONS
PRIMARY COSMIC RADIATION
Origin
On the origin of extragalactic infrared radiation, 11:30791 (RA;GB)
Radiobiology
Radiobiological studies on eggs of the rice weevil (Tribolium confusum) after exposure to heavy primary particles of the cosmic radiation, 11:30693 (R;DE;In German)
COSMIC RAY DETECTION
Plastic Scintillation Detectors
Plastic scintillator response to relativistic nuclei, Z<=28, 11:30484 (J;NL)
COSMOGONY
See COSMOLOGY
COSMOLOGICAL MODELS
Compactification
Finite temperature instability for compactification, 11:30763 (R;US)
Expansion
Comments on the chaotic inflation, 11:30779 (RA;JP)
Inflationary universe model, 11:30777 (RA;JP)
Inflation
Bianchi models and new inflation, 11:30766 (R;US)
Missing Mass
Current status of missing mass problem, 11:30773 (RA;JP)
Scalar Fields
On a quantized scalar field in the combined de Sitter-Nariai universe, 11:30805 (R;JP)
Problems in the perturbation analysis of a universe dominated by a coherent scalar field, 11:30778 (RA;JP)
Space-Time
Multiple images of our galaxy in closed, multiply connected cosmologies, 11:30770 (R;BR)
Universe created from 'nothing' as a broken symmetry theory of gravity, 11:30769 (R;XA)
Stochastic Processes
Comments on the chaotic inflation, 11:30779 (RA;JP)
COSMOLOGY
Anisotropy
Effect of inflation on anisotropic cosmologies, 11:30765 (R;US)
Background Radiation
Cosmological results from IRAS, 11:30804 (RA;GB)
Fundamental Constants
Cosmic numbers and quantum theory, 11:30768 (R;XA)
Magnetic Monopoles
Astrophysical constraints on the monopole abundance, 11:30782 (RA;JP)
Neutrino Oscillation
Structure in the universe from massive neutrinos, 11:30783 (R;US)
COSMOS
See UNIVERSE
COSTA RICA
Resource Development
Geothermal activities in Central America, 11:29981 (RA;US)
COUNTERS (RADIATION)
See RADIATION DETECTORS
COUNTY BUILDINGS
See PUBLIC BUILDINGS
COUPLED REACTOR CORES
Power Distribution
Versatile computer code for reactor neutronic calculation advances in qualification of the different modules, 11:29794 (R;FR;In French)
COURT BUILDINGS
See PUBLIC BUILDINGS
COVER GAS
Monitoring
Gas generation measurements on tritiated waste materials, 11:29438 (RA;US)
CRACK GROWTH
See CRACK PROPAGATION
CRACK PROPAGATION
Data Processing
Microscopic image analysis of slow crack growth in vitreous materials, 11:30388 (R;US)
Meetings
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
CRANES
Inspection
Electric overhead traveling cranes: procedures for certification, inspection, and preventive maintenance, 11:30343 (R;US)
Maintenance
Electric overhead traveling cranes: procedures for certification, inspection, and preventive maintenance, 11:30343 (R;US)
CREEKS
See STREAMS
CRESOLS
Enthalpy
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)

Phase Studies
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
Vapor Pressure
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
CRESYLIC ACID
See CRESOLS
CRITICALITY ACCIDENTS
See RADIATION ACCIDENTS
CROWN ETHERS
See POLYETHYLENE GLYCOLS
CRUDE OIL
See PETROLEUM
CRYOPUMPS
Computerized Simulation
Calculating the pumping speed of cryopanels: option to Monte Carlo methods, 11:31250 (J;US)
Performance
Calculating the pumping speed of cryopanels: option to Monte Carlo methods, 11:31250 (J;US)
CRYOSTATS
Control Systems
A reliable automatic liquid nitrogen filling system, 11:30429 (J;US)
CRYSTAL LATTICES
Stability
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
CRYSTAL STRUCTURE
See also CRYSTAL LATTICES
Defects
Defect solid state '84. Programme and abstract booklet, 11:30159 (R;ZA)
CRYSTALLINE ROCKS
See IGNEOUS ROCKS
METAMORPHIC ROCKS
CRYSTALS
See also LIQUID CRYSTALS
MONOCRYSTALS
POLYCRYSTALS
Electron Spin Resonance
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Mathematical Models
Crystallography of icosahedral crystals, 11:30952 (R;US)
Molecular Structure
Application of external forces to computational models of crystals, 11:30116 (J;DK)
Point Defects
Diffusion and point defects in Cu_2O, 11:30139 (J;GB)
Self-Diffusion
Diffusion and point defects in Cu_2O, 11:30139 (J;GB)
Shear Properties
Application of external forces to computational models of crystals, 11:30116 (J;DK)
CURIUM COMPLEXES
Enthalpy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Entropy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Free Enthalpy
Calorimetric studies of curium complexation, 11:30320 (J;US)
CURRENT-DRIVE HEATING
Efficiency
Top-versus-side launch of lower hybrid waves in PLT, 11:30990 (J;AT)
Numerical Solution
Numerical modeling of lower hybrid heating and current drive, 11:30979 (R;US)
CURRENTS (ELECTRIC)
See ELECTRIC CURRENTS
CYANIDES
Specific compounds, except those of significance to energy research and development, should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Oxidation
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Photochemistry
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Separation Processes
Selectivity variations in anion chromatography, 11:30184 (D;US)
CYCLOALKENES
See also CYCLOPENTADIENE
Configuration
Conformational analysis of 1,4-cyclohexadienes. A shallow boat-shaped 1,4-dihydronaphthalene, 11:30261 (J;US)
Conformational Changes
Conformational analysis of 1,4-cyclohexadienes. A shallow boat-shaped 1,4-dihydronaphthalene, 11:30261 (J;US)
CYCLOHEXANE
Pyrolysis
Formation of benzene by the pyrolysis of 4-vinylcyclohexene regiospecific formation of anthracenes in the pyrolysis of dibenzosuberones and related systems, 11:30271 (D;US)
Radiolysis
Pulse radiolysis of cyclohexane: the identity of the high-mobility positive ion (Pulsed Electron Beam), 11:30304 (J;NL)
Solvent Properties
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
CYCLOPENTADIENE
Binding Energy
Comparison of thionitrosyl and nitrosyl bonding in dicarbonyl(eta^5-cyclopentadienyl)chromium complexes by gas-phase ultraviolet and x-ray photoelectron spectroscopy, 11:30266 (J;US)
CYCLOTRONS
Construction
Low energy cyclotron for radiocarbon dating, 11:30410 (R;US)
Ion Beam Injection
Radial injection in the Orsay cryogenic cyclotron project, 11:30408 (R;FR;In French)
Performance Testing
Low energy cyclotron for radiocarbon dating, 11:30410 (R;US)
CYLINDERS
Objects of cylindrical shape. For containers see headings such as GAS CYLINDERS.
Design
Thermal analysis of UF_6 cylinder inside a protective overpack, 11:30385 (R;US)
Thermal Analysis
Thermal analysis of UF_6 cylinder inside a protective overpack, 11:30385 (R;US)
CYSTEINE
Decomposition
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Oxidation
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Radiolysis
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Reduction
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)

D

D MESONS
Prior to Jan. 1985 this information was indexed with the descriptor D-1865 RESONANCES.
Lifetime
Lifetime measurements of hadrons containing heavy quarks at PETRA and PEP, 11:30843 (R;GB)
Quarks
Lifetime measurements of hadrons containing heavy quarks at PETRA and PEP, 11:30843 (R;GB)
D PLUS RESONANCES
See D MESONS
D ZERO RESONANCES
See D MESONS
D-1865 RESONANCES
See D MESONS
DARK MATTER
See NONLUMINOUS MATTER
DARRIEUS ROTORS
Aerodynamics
Aerodynamic calculational methods for curved-blade Darrieus VAWT WECS, 11:29663 (RA;DE)
Calculation Methods
Aerodynamic calculational methods for curved-blade Darrieus VAWT WECS, 11:29663 (RA;DE)
DATA ACQUISITION SYSTEMS
Versatile computer based system for data acquisition manipulation and presentation, 11:31275 (R;GB)
Design
MARK II end cap calorimeter electronics, 11:30470 (J;US)
Overview of the data acquisition electronics system design for the SLAC linear collider detector (SLD), 11:30443 (J;US)
System architecture for high speed reconstruction in Time-Of-Flight positron tomography, 11:30659 (R;FR)
Performance Testing
Performance report for Stanford/SLAC Multi-Channel Sample-and-Hold Device, 11:30457 (J;US)
DATA ANALYSIS
Programming Languages
User interaction model for manipulation of large data sets, 11:31294 (BA;US)
DATA TRANSMISSION SYSTEMS
Electronic mail at ANL. Revision, 11:31276 (R;US)
DAVIS BESSE REACTOR
See DAVIS BESSE-1 REACTOR
DAVIS BESSE-1 REACTOR
Ottawa, Ohio, USA
Reactor Accidents
Summary of NUREG-1154: loss of main and auxiliary feedwater event at the Davis-Besse Plant on June 9, 1985, 11:29873 (J;US)
DEBRIS (NUCLEAR)
See FISSION PRODUCTS
DECANE
Solvent Properties
Phase behavior of coal fluids: data for correlation development. Report for the period: November 1, 1985-January 31, 1986, 11:29176 (R;US)
DECARBOXYLASE
See DECARBOXYLASES
DECARBOXYLASES
Biochemical Reaction Kinetics
Pyruvate decarboxylase from Zea mays L., 11:30628 (J;US)
DECIDUOUS TREES
See TREES
DECONTAMINATION
Personnel
Revised worker exposure estimates for TMI-2 radioactive waste processing and decontamination, 11:29442 (RA;US)
Process Solutions
Chemical hazards from decontamination solutions in low level waste, 11:29354 (RA;US)
DECONTAMINATION FACTOR
See DECONTAMINATION
DEER
Contamination
Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington, 11:30585 (J;NL)
DEFENSE
See NATIONAL DEFENSE
DEHUMIDIFIERS
Heat Transfer
Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests, 11:29603 (R;US)
Mass Transfer
Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests, 11:29603 (R;US)
Silica Gel
Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests, 11:29603 (R;US)
DEHYDROGENASES
See OXIDOREDUCTASES
DELAYED RADIATION EFFECTS
Mathematical Models
Late somatic effects, 11:29448 (RA;US)
DELAYED RADIATION INJURIES
See DELAYED RADIATION EFFECTS
DELETIONS (CHROMOSOMAL)
See CHROMOSOMAL ABERRATIONS
DELTA RESONANCES (MESON)
See MESON RESONANCES
DENELCOR COMPUTERS
Parallel Processing
Two parallel formulations of particle-in-cell models, 11:31291 (BA;US)
DENITRIFICATION
Catalysts
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
DENMARK
Public Buildings
Electricity use in the public sector - a few examples from Denmark, 11:29962 (RA;US)
Seasonal Thermal Energy Storage
STES newsletter: a quarterly review of seasonal thermal energy storage, 11:29988 (J;US)
Service Sector
Disaggregating the service sector: survey results from Denmark, 11:29963 (RA;US)
Service-sector electricity consumption in Denmark, 11:29949 (RA;US)
DENSITY (ELECTRON)
See ELECTRON DENSITY
DENSITY (FLUX)
See FLUX DENSITY
DEOXYPENTOSE NUCLEIC ACID
See DNA
DEOXYRIBONUCLEIC ACID
See DNA
DEPLETION (NUCLEAR FUELS)
See BURNUP
DEPOSITION
For the laying down of a substance on a surface; for deposition of elements and nuclides in tissues of living organisms use RETENTION.
Calculation Methods
Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)
Mathematical Models
Modeling turbulent exchange in forest canopies, 11:30543 (RA;US)
DESOXYRIBONUCLEIC ACID
See DNA
DESULFURIZATION
Mathematical Models
Modeling of SO_2 removal in spray-dryer flue-gas desulfurization system, 11:29193 (RA;US)

Performance Testing
Experience from wet/dry desulfurization in Sweden, 11:29197 (R;SE)
DETECTION (NUCLEAR EXPLOSIONS)
See NUCLEAR EXPLOSION DETECTION
DETECTION (SEISMIC)
See SEISMIC DETECTION
DETECTORS (RADIATION)
See RADIATION DETECTORS
DETONATION WAVES
Wave Propagation
Characterization of the pressure field induced by the explosion in air of a hydrocarbon-air a mixture with slow deflagration or fast deflagration, 11:29798 (R;FR;In French)
DETONATIONS
Mathematical Models
Chemical kinetics of hydrocarbon oxidation in gaseous detonations, 11:29489 (J;US)
Chemical kinetics of propane oxidation in gaseous detonations, 11:29488 (J;US)
DETONATORS
Design
Limitations of commercial explosives and blasting caps and their effect on in situ blast design, 11:29263 (BA;US)
DEUTERIDES
Atom-Atom Collisions
Reactive and inelastic energy transfer in $H+D_2$ collisions studied by single-collision CARS spectroscopy, 11:30819 (B;US)
DEUTERIUM
Adsorption
Dynamics of dissociative adsorption of hydrogen on Ni(100), 11:30216 (J;US)
Chemical Reaction Yield
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Electrochemistry
Hydrogen, 11:30220 (BA;US)
Isotope Effects
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Formation of benzene by the pyrolysis of 4-vinylcyclohexene regiospecific formation of anthracenes in the pyrolysis of dibenzosuberones and related systems, 11:30271 (D;US)
Hydrogen, 11:30220 (BA;US)
I. Kinetic and mechanistic study of the [4+4] dimerization of 2,3-dimethylene-2,3-dihydrofuran. II. Preparation of 2,3-dimethylene-2,3-dihydrobenzo[B]furan by the flash vacuum pyrolysis of 2-methyl-3-benzo[B]furylmethyl benzoate. III. Reaction of 2,3-dimethylene-2,3-dihydrofuran with triplet oxygen, 11:30270 (D;US)
Identifying alkylbenzene isomers with chemical ionization-proton exchange mass spectrometry, 11:30268 (J;US)
NMR Spectra
The determination of deuterium and tritium in effluent wastewater by pulsed nuclear magnetic resonance spectroscopy, 11:31101 (J;US)
Pumping
Cryopumping hydrogen isotope mixtures in MFTF-B with and without argon adsorbent, 11:31254 (J;US)
Solvent Properties
Small-angle neutron-scattering study of alkyl polyoxyethylene sulfate micelles. Effect of the number of polyoxyethylene groups on n-dodecyl polyoxyethylene sulfate in D_2O/H_2O mixtures at 25°C, 11:30263 (J;US)
DEUTERIUM COMPOUNDS
See also DEUTERIDES
Chemical Reactions
Hydrogen-atom abstraction from alkanes by OH. 2. Ethane, 11:30251 (J;US)
Phase Transformations
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
Phosphorescence
Effect of high pressure on critical concentration energy transport in isotopically mixed naphthalene crystals, 11:30255 (J;US)
Polymerization
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
DEUTERIUM TARGET
Deuteron Reactions
Nuclear collision theory with many-body correlations, 2. Deuteron+deuteron elastic scattering, 11:30893 (R;JP)
Neutrino Reactions
K-meson production by nu/sub μ/-deuterium reactions near threshold: implications for nucleon-decay searches, 11:30824 (R;US)
Photonuclear Reactions
Pion photoproduction in nuclei, 11:30892 (R;FR)
Polarization
TRIUMF polarized deuteron target NMR system, 11:30417 (R;CA)
DEUTERON BEAMS
Energy Range
Comparison of diode voltage and ion energy for an intense pulsed ion-beam diode, 11:31268 (BA;US)
Ion Sources
Comparison of diode voltage and ion energy for an intense pulsed ion-beam diode, 11:31268 (BA;US)
DEUTERON REACTIONS
Correlation Functions
Nuclear collision theory with many-body correlations, 2. Deuteron+deuteron elastic scattering, 11:30893 (R;JP)
Elastic Scattering
Nuclear collision theory with many-body correlations, 2. Deuteron+deuteron elastic scattering, 11:30893 (R;JP)
DEUTERON-DEUTERON INTERACTIONS
See DEUTERIUM TARGET
DEUTERON REACTIONS
DEVELOPING COUNTRIES
See also ALGERIA
BOTSWANA
BRAZIL
BURUNDI
COSTA RICA
EGYPTIAN ARAB REPUBLIC
EL SALVADOR
ETHIOPIA
GUATEMALA
HONDURAS
INDIA
JAMAICA
NEPAL
OMAN
PANAMA
POLAND
REPUBLIC OF KOREA
SINGAPORE
THAILAND
TOGO
TUNISIA
UGANDA
URUGUAY
VENEZUELA
VIET NAM
Biomass Conversion Plants
Biogas workshop on community plants. Report, 11:29461 (R;DE)
DEVICES
See EQUIPMENT
DEVONIAN SHALES
See BLACK SHALES
DIAMOND DRILLING EQUIPMENT
See DRILLING EQUIPMENT
DIAPHRAGMS (THERMONUCLEAR DEVICE)
See LIMITERS
DIBENZOPYRROLES
See CARBAZOLES
DIBORANE
See BORANES
DICHLOROMETHANE
See METHYLENE CHLORIDE

DIELECTRIC MATERIALS
Physical Radiation Effects
Materials problems for highly irradiated ICRH Launchers in fusion reactors, 11:31195 (J;US)
Thermal Conductivity
Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiAlO_2$ solid breeders with and without irradiation effects, 11:31255 (J;US)
DIELECTRICS
See DIELECTRIC MATERIALS
DIENES
See also BUTADIENE
CYCLOPENTADIENE
Decomposition
Thermodynamic and kinetic properties of the cyclohexadienyl radical, 11:30243 (J;US)
DIESEL ENGINES
Alcohol Fuels
Alcohol as a fuel in a high speed diesel engine with double injection system, 11:30041 (R;FI;In Finnish)
Cold-start tests with speed diesel engines using alcohol as main fuel, 11:30042 (R;FI;In Finnish)
Endurance test of a high speed diesel engine using ethanol fuel, 11:30038 (R;FI;In Finnish)
Exhaust gas analysis of a diesel engine using alcohol as a fuel, 11:30040 (R;FI;In Finnish)
Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines, 11:30037 (R;FI;In Finnish)
Bench-Scale Experiments
Exhaust gas analysis of a diesel engine using alcohol as a fuel, 11:30040 (R;FI;In Finnish)
Design
Advanced adiabatic diesel engine for passenger cars, 11:30045 (B;US)
Ethanol Fuels
Practical properties of ethanol used as a fuel in diesel engine supercharged in different ways, 11:30039 (R;FI;In Finnish)
Fuel Injection Systems
Alcohol as a fuel in a high speed diesel engine with double injection system, 11:30041 (R;FI;In Finnish)
Cold-start tests with speed diesel engines using alcohol as main fuel, 11:30042 (R;FI;In Finnish)
Endurance test of a high speed diesel engine using ethanol fuel, 11:30038 (R;FI;In Finnish)
Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines, 11:30037 (R;FI;In Finnish)
Fuel Substitution
The effect of alcohol fueling on diesel engine durability, 11:30046 (B;US)
Ignition Systems
Practical properties of ethanol used as a fuel in diesel engine supercharged in different ways, 11:30039 (R;FI;In Finnish)
Performance Testing
The effect of alcohol fueling on diesel engine durability, 11:30046 (B;US)
Reliability
Review of issues related to improving nuclear power plant diesel generator reliability, 11:29803 (R;US)
Wear Resistance
The effect of alcohol fueling on diesel engine durability, 11:30046 (B;US)
DIESEL FUELS
Ignition
Induction period for ignition of fuel sprays at high temperatures and pressures, 11:30033 (R;US)
DIESEL OIL (FRACTION)
See DIESEL FUELS
DIFFUSION
Mathematical Models
Wind direction meander at a coastal site during onshore flows, 11:30521 (J;US)
Reviews
Some comments on multicomponent diffusion: negative main term diffusion coefficients, second law constraints, solvent choices, and reference frame transformations, 11:30198 (J;US)
DIGESTER GAS
See METHANE
DIMERS
Dissociation
Vibrational predissociation of SF_6 clusters in a supersonic molecular beam, 11:30290 (J;US)
Photolysis
Vibrational predissociation of SF_6 clusters in a supersonic molecular beam, 11:30290 (J;US)
DIMETHYL KETONE
See ACETONE
DIMETHYLBENZENES
See XYLENES
DIOLS
See GLYCOLS
DIPHENYL KETONE
See BENZOPHENONE
DIPHENYLPHOSPHINE OXIDE
See ORGANIC PHOSPHORUS COMPOUNDS
DIRAC MONOPOLES
See MAGNETIC MONOPOLES
DIRECTED-ENERGY WEAPONS
Power Demand
Estimated burst power requirements for selected SDI missions, 11:30346 (R;US)
Power Supplies
Estimated burst power requirements for selected SDI missions, 11:30346 (R;US)
DISEASE INCIDENCE
Mathematical Models
Thyroid effects, 11:30695 (RA;US)
DISEASES
Limited to diseases of animals including man; see also PLANT DISEASES.
See also HEMIC DISEASES
NEOPLASMS
Pathology
Defective DNA repair and cancer-prone disorders of man, 11:30674 (BA;US)
DISINTEGRATION (FISSION)
See FISSION
DISMANTLING (REACTOR)
See REACTOR DISMANTLING
DISPERSANTS (CHEMICAL)
See SURFACTANTS
DISSOLVED OXYGEN
See OXYGEN
DISTILLATES
Boiling Points
Hydrotreatment studies of Swedish peat products. Progress report No. 3 (Final), 11:29168 (R;SE)
Spectroscopy
Hydrotreatment studies of Swedish peat products. Progress report No. 3 (Final), 11:29168 (R;SE)
DISTILLATION EQUIPMENT
See also RETORTS
Construction
Low temperature distillation system for tritium recovery, 11:29406 (RA;US)
Design
Low temperature distillation system for tritium recovery, 11:29406 (RA;US)
DISTRICT HEATING
Economic Analysis
Heat pumps for district heating of smaller cities, 11:30024 (R;FI;In Finnish)
Heat Pumps
Heat pumps for district heating of smaller cities, 11:30024 (R;FI;In Finnish)
Research Programs
Research project District Heating, 11:29918 (R;SE;In Swedish)
DNA
Hybridization
Episomal DNA as a molecular probe of cytoplasmic male sterility in S Zea mays, 11:30650 (BA;US)

DNA REPAIR
Biological Pathways
Saturation of repair, 11:30722 (BA;US)
Inhibition
Inhibition by hyperthermia of repair synthesis and chromatin reassembly of ultraviolet-induced damage to DNA, 11:30700 (J;US)
Radioinduction
DNA repair in PHA stimulated human lymphocytes, 11:30691 (R;IT;In Italian)
DODECANOIC ACID
Comparative Evaluations
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
Molecular Structure
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
Surface Properties
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
DOLOMITE
Geochemistry
Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985, 11:30758 (R;US)
Isotope Ratio
Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985, 11:30758 (R;US)
DOMESTIC WASTES
See MUNICIPAL WASTES
DOPED MATERIALS
Acoustic ESR
Electron spin echo studies of donor-doped poly(p-phenylene) and its oligomers, 11:30272 (J;GB)
DORIS STORAGE RING
Research Programs
Participation in the ARGUS experiment at the DORIS collider at DESY, Hamburg, Germany, 11:30823 (R;US)
DORMITORIES
See RESIDENTIAL BUILDINGS
DOSIMETRY
See also GAMMA DOSIMETRY
NEUTRON DOSIMETRY
PERSONNEL DOSIMETRY
Evaluated Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Experimental Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Theoretical Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
DOUBLE FOCUSING SPECTROMETERS
See FLAT MAGNETIC SPECTROMETERS
DOUBLET 3 DEVICES
See DOUBLET REACTORS
DOUBLET REACTORS
ICR Heating
Experimental measurements of the ion cyclotron antennas' coupling and RF characteristics, 11:31193 (J;US)
DOUBLET-3 DEVICE
Ballooning Instability
Non-ideal ballooning modes in a tokamak, 11:30993 (J;AT)
Beam Dumps
Modified 180° separation magnet for DIII-Big Dee neutral beam injectors, 11:31207 (J;US)
Beam Separators
Modified 180° separation magnet for DIII-Big Dee neutral beam injectors, 11:31207 (J;US)
Breakeven
Big Dee - A flexible facility operating near breakeven conditions, 11:31119 (J;US)
Data Processing
Physics analysis database for the DIII-D tokamak, 11:31069 (R;US)
ICR Heating
ICRH coupling in DIII-D, 11:31028 (R;US)
Ion Temperature
Comparison of experimentally-inferred ion thermal diffusivities with neoclassical theory for neutral beam-heated discharges in the Doublet III tokamak, 11:30969 (R;US)
Modifications
Big Dee - A flexible facility operating near breakeven conditions, 11:31119 (J;US)
Neutral Atom Beam Injection
Modified 180° separation magnet for DIII-Big Dee neutral beam injectors, 11:31207 (J;US)
Plasma Scrape-Off Layer
Divertor and edge plasma properties in Doublet III expanded boundary discharges, 11:30989 (J;AT)
Poloidal Field Divertors
Divertor and edge plasma properties in Doublet III expanded boundary discharges, 11:30989 (J;AT)
DOWEX
See ORGANIC ION EXCHANGERS
DPO
See ORGANIC PHOSPHORUS COMPOUNDS
DRIFT CHAMBERS
Analog-to-Digital Converters
dE/dx electronics for MARK II experiment at SLAC, 11:30445 (J;US)
CAMAC System
Waveform sampler CAMAC module, 11:30444 (J;US)
Construction
Radial wire drift chambers for CDF forward tracking, 11:30454 (J;US)
Data Acquisition
Soudan 2 data acquisition and trigger electronics, 11:30448 (J;US)
Data Acquisition Systems
MARK II end cap calorimeter electronics, 11:30470 (J;US)
SLAC Scanner Processor applications in the data acquisition system for the upgraded MARK II detector, 11:30462 (J;US)
Design
Feasibility tests of a high resolution sampling radial drift chamber, 11:30488 (J;NL)
Fastbus System
dE/dx electronics for MARK II experiment at SLAC, 11:30445 (J;US)
SLAC Scanner Processor applications in the data acquisition system for the upgraded MARK II detector, 11:30462 (J;US)
Feasibility Studies
Feasibility tests of a high resolution sampling radial drift chamber, 11:30488 (J;NL)
Performance
Performance of the SLD Central Drift Chamber prototype, 11:30476 (J;US)
Performance of the cylindrical drift chamber for the crystal box at LAMPF, 11:30491 (J;NL)
Performance Testing
Analysis of digitized waveforms in a prototype of the SLD central drift chamber, 11:30452 (J;US)
Radial wire drift chambers for CDF forward tracking, 11:30454 (J;US)
Readout Systems
dE/dx electronics for MARK II experiment at SLAC, 11:30445 (J;US)
Trigger Circuits
Soudan 2 data acquisition and trigger electronics, 11:30448 (J;US)
Wave Forms
Analysis of digitized waveforms in a prototype of the SLD central drift chamber, 11:30452 (J;US)
DRILL HOLES
See BOREHOLES

DRILLING EQUIPMENT
Design
Earth science instrumentation update review FY1985, 11:29634 (RA;US)
Field Tests
Earth science instrumentation update review FY1985, 11:29634 (RA;US)
DRINKING WATER
Contamination
Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
DRY DEPOSITION
See DEPOSITION
DRY STORAGE
Radiation Hazards
Radiological analysis for dry cask storage of spent fuels, 11:29443 (RA;US)
D-T REACTORS
Breeding Blankets
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Breeding Ratio
Deuterium-tritium fuel self-sufficiency in fusion reactors, 11:31086 (J;US)
Coolants
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Elmo Bumpy Torus
The role of fusion reaction products in the stability of EBT reactors, 11:31167 (J;US)
Fuel Cycle
An assessment of tritium breeding requirements based on the tritium fuel cycle, 11:31088 (J;US)
Materials Testing
Transmission of fast neutrons through an iron sphere, 11:31091 (J;US)
Muon-Catalyzed Fusion
Reactivation coefficient of muon-catalyzed deuterium-tritium fusion and its enhancement, 11:31089 (J;US)
Thermonuclear Reactor Materials
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
DTO
See DEUTERIUM COMPOUNDS
DUBAI
See UNITED ARAB EMIRATES
DUCTS
Design
Mechanically attached load pad for liquid metal nuclear reactor fuel assemblies, 11:29782 (P;US)
DUSTS
Air Pollution Control
Ceramic-made boxer-charger for precharging applications, 11:29713 (RA;US)
Development and high temperature application of a novel method for measuring ash deposits and cake removal on filter bags, 11:29688 (RA;US)
Practical implications of pulse energization of electrostatic precipitators, 11:29706 (RA;US)
Technical manual on the identification, assessment, and control of fugitive emissions, 11:30532 (RA;US)
Windbreak effectiveness for the control of fugitive-dust emissions from storage piles - a wind tunnel study, 11:30535 (RA;US)
Ecological Concentration
Quantification of roadway fugitive dust at a large Midwestern steel mill, 11:30533 (RA;US)
Electrical Properties
Onset of electrical breakdown in dust layers, 11:29720 (RA;US)
Ignition
Fire hazards of oil shale dust layers on hot surfaces, 11:29278 (BA;US)
DYE LASERS
Design
Efficient generation of tunable radiation below 100 nm in krypton, 11:30370 (BA;US)
Extreme Ultraviolet Radiation
Efficient generation of tunable radiation below 100 nm in krypton, 11:30370 (BA;US)
Light Sources
Resonantly enhanced method for generation of tunable, coherent vacuum ultraviolet radiation, 11:30369 (P;US)
Optical Pumping
Resonantly enhanced method for generation of tunable, coherent vacuum ultraviolet radiation, 11:30369 (P;US)
Resonance
Resonantly enhanced method for generation of tunable, coherent vacuum ultraviolet radiation, 11:30369 (P;US)
Tuning
Resonantly enhanced method for generation of tunable, coherent vacuum ultraviolet radiation, 11:30369 (P;US)
DYMAC SYSTEM
See NUCLEAR MATERIALS MANAGEMENT
PLUTONIUM
DYNAMIC INDUCER ROTORS
See TIPVANE ROTORS
DYNAMIC MATERIALS ACCOUNTABILITY SYSTEM
See NUCLEAR MATERIALS MANAGEMENT
PLUTONIUM
DYNAMICS (BEAM)
See BEAM DYNAMICS
DYSPROSIUM 158
Energy Levels
Microscopic study of the S band in the generator co-ordinate approach, 11:30918 (R;XA)
DYSPROSIUM 163
Electron Capture
Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho, 11:30834 (RA;JP)

E

E CODES
Revision of Primary Standards Laboratory's methods to calculate water vapor pressures (ENHANC, RH, RHTAB), 11:31286 (R;US)
EARLY RADIATION EFFECTS
Mathematical Models
Early occurring and continuing effects, 11:29447 (RA;US)
EARLY RADIATION INJURIES
See EARLY RADIATION EFFECTS
EARTH ATMOSPHERE
See also EARTH MAGNETOSPHERE
IONOSPHERE
STRATOSPHERE
Air Pollution
Airborne Lidar measurements of aerosols, mixed layer heights, and ozone during the 1980 PEPE/NEROS summer field experiment, 11:30538 (R;US)
Measurements of neutral constituents using far infrared remote sensing techniques, 11:30539 (R;IT)
Microwave limb sounder for stratospheric measurements, 11:30181 (R;US)
Air Pollution Monitoring
Ozone measurements near the ground and in the atmosphere in the first half-year 1985, 11:30541 (R;DE;In German and English)
Radionuclide Migration
Local scale atmospheric diffusion at a coastal site in the presence of breeze effects (Phase I and II: data collection at a coastal site and off shore). Vol. 2, 11:30558 (R;FR)
Research Programs
Present state of knowledge of the upper atmosphere: an assessment report, 11:30540 (R;US)
EARTH MAGNETOSPHERE
Charged Particle Detection
Hostile energetic particle radiation environments in earth's outer magnetosphere, 11:30809 (R;US)

EARTH PLANET
Energy Balance
Earth Radiation Budget Experiment (ERBE) scanner instrument anomaly investigation, 11:30426 (R;US)
Radiation Monitors
Earth Radiation Budget Experiment (ERBE) scanner instrument anomaly investigation, 11:30426 (R;US)
EBIC
See SCANNING ELECTRON MICROSCOPY
ECCS
Flow Blockage
Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 1, 11:29840 (R;FR)
Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 2, 11:29841 (R;FR)
ECHOGRAPHY
See ULTRASONOGRAPHY
ECR HEATING
Efficiency
Electron cyclotron heating at down-shifted frequencies in existing tokamak devices, 11:30988 (J;AT)
EDEMA
Diagnosis
A new Compton densitometer for measuring pulmonary edema, 11:30665 (J;US)
EDTA
Decomposition
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Enthalpy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Entropy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Free Enthalpy
Calorimetric studies of curium complexation, 11:30320 (J;US)
Ion Exchange Chromatography
Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)
Leaching
Release of organic reagents from solidified decontamination wastes, 11:29433 (RA;US)
Oxidation
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Radiolysis
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Reduction
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Spectrophotometry
Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)
EDUCATIONAL FACILITIES
Design
Efficient utilization of energy in the growth of existing campuses, 11:30007 (RA;US)
Energy Conservation
Efficient utilization of energy in the growth of existing campuses, 11:30007 (RA;US)
Surveys
Nuclear engineering enrollments and degrees, 1985, 11:31271 (R;US)
EFFLUENTS (GASEOUS)
See GASEOUS WASTES
EFFLUENTS (LIQUID)
See LIQUID WASTES
EFFLUENTS (RADIOACTIVE)
See RADIOACTIVE EFFLUENTS
EFFUSION
See DIFFUSION
EGGS
Encapsulation
Egg envelopes in vertebrates, 11:30672 (J;US)
EGYPTIAN ARAB REPUBLIC
Biomass Conversion Plants
Pilot experiment for cooperative community biogas facilities in rural Egypt indicated social failure, 11:29470 (RA;DE)
Energy Supplies
Egypt - energy situation 1984, 11:29922 (R;DE;In German)
EHF RADIATION
See MICROWAVE RADIATION
EINSTEIN FIELD EQUATIONS
Vacuum States
Non-static vacuum strings: exterior and interior solutions, 11:30767 (R;US)
EINSTEIN-DE SITTER MODEL
See COSMOLOGICAL MODELS
EINSTEINIUM 254
Cross Sections
Proposed production of a large (~40μg) sample of ^{254}Es, 11:30308 (R;US)
Isotope Production
Proposed production of a large (~40μg) sample of ^{254}Es, 11:30308 (R;US)
EL SALVADOR
Resource Development
Geothermal activities in Central America, 11:29981 (RA;US)
ELASTIC PROPERTIES
See ELASTICITY
ELASTICITY
Computerized Simulation
Elasto-plastic benchmark calculations. Step 1: verification of the numerical accuracy of the computer programs (LMFBR components), 11:31278 (R;FR)
ELECTRIC BATTERIES
Devices for production and/or storage of electrical energy from chemical reactions; excludes FUEL CELLS and RADIOISOTOPE BATTERIES.
See also LEAD-ACID BATTERIES
METAL-NONMETAL BATTERIES
Charges
Simple methodology for obtaining battery discharge times (and vehicle ranges) for arbitrarily structured load profiles, 11:30061 (RA;US)
Design
Requirements for EV-batteries and consequences for test procedures, 11:30050 (RA;US)
Failures
How handy is Weibull or, the use of failure distributions in the planning and analysis of battery experiments?, 11:29900 (RA;US)
Introduction to Weibull analysis, 11:29901 (RA;US)
Performance
Generic battery model for electric and hybrid vehicle simulation performance prediction, 11:30067 (BA;GB)
MARECS and ECS: the first few years in orbit, 11:29507 (RA;FR)
Requirements for EV-batteries and consequences for test procedures, 11:30050 (RA;US)
Performance Testing
Application testing of batteries for utility load leveling and customer applications at the Battery Energy Storage Test (BEST) Facility, 11:29671 (RA;US)
Autonormalization of battery test data to significantly reduce impact of battery aging on test results, 11:29886 (RA;US)
Battery data for use in expert systems, 11:29892 (RA;US)
Data acquisition and control instrumentation of the BEWAG battery test facility, 11:29894 (RA;US)
Examination of battery-related electric vehicle track and field measurements, 11:30058 (RA;US)
Flowing electrolyte batteries test methods and results, 11:29887 (RA;US)
Overview of rechargeable battery testing in the United States, 11:29884 (RA;US)
Rationale and methodology for group testing of electric vehicle batteries, 11:30051 (RA;US)

Simple methodology for obtaining battery discharge times (and vehicle ranges) for arbitrarily structured load profiles, 11:30061 (RA;US)
Test programs at the National Battery Test Laboratory, 11:29885 (RA;US)
Testing methods for lithium-molybdenum disulfide intercalation batteries, 11:29890 (RA;US)
Utility requirements for battery energy storage and their effects on battery test programs, 11:29670 (RA;US)
Validity of cycle life bench test data in relation to real world in-vehicle testing, 11:30059 (RA;US)
Service Life
How handy is Weibull or, the use of failure distributions in the planning and analysis of battery experiments?, 11:29900 (RA;US)
Solid Electrolytes
Rapid testing of beta alumina ceramics, 11:29893 (RA;US)

ELECTRIC CABLES
See also SUPERCONDUCTING CABLES
Electrical Insulation
Stripline insulation design analysis by partial discharge measurements, 11:29564 (R;US)

ELECTRIC CONTACTS
Fabrication
Ink jet printing of silver metallization for photovoltaics. Quarterly technical report, January 1-March 31, 1986, 11:29505 (R;US)

ELECTRIC CURRENTS
Spatial Distribution
Distribution of electric fault currents in MHD faraday generators, 11:31267 (BA;US)

ELECTRIC POTENTIAL
Forecasting
Prediction of voltage-current curves for novel electrodes arbitrary wire electrodes on axis, 11:29699 (RA;US)

ELECTRIC POWER
See also HYDROELECTRIC POWER
Cost
Physical coal beneficiation and electricity costs, 11:29210 (R;GB)
Energy Consumption
Calculation of the consumption of electric energy in buildings, 11:29996 (R;FI;In Finnish)
Power Losses
Compensation of reactive power in buildings, 11:29998 (R;FI;In Finnish)
Sales
Directions in commercial sector electricity forecasting, 11:29972 (RA;US)

ELECTRIC POWER INDUSTRY
Energy Consumption
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume IA. Appendices with 1975 data. Final report, 11:29946 (R;US)
Environmental Impacts
Impact of coming particulate control requirements on the utility industry, 11:30565 (RA;US)

ELECTRIC POWER SYSTEMS
See POWER SYSTEMS

ELECTRIC UTILITIES
Energy Storage
Application testing of batteries for utility load leveling and customer applications at the Battery Energy Storage Test (BEST) Facility, 11:29671 (RA;US)
Battery storage test facility for load frequency control and instantaneous reserve, 11:29672 (RA;US)
Fundamental studies of utility requirement for secondary batteries - lead-acid batteries, 11:29673 (RA;US)
Multiple constant power discharge tester, 11:29897 (RA;US)
Utility requirements for battery energy storage and their effects on battery test programs, 11:29670 (RA;US)
Load Analysis
Getting end-use load shape data for commercial buildings - the energy information project at Sierra Pacific Power Company, 11:29965 (RA;US)
Load Management
Accelerated life cycle test advanced lead-acid cells at elevated temperature, 11:29943 (RA;US)
Report brief. Category: evaluation and modeling, 11:30015 (R;US)
Planning
Directions in commercial sector electricity forecasting, 11:29972 (RA;US)
Forecasting at Sierra Pacific Power Company, 11:29973 (RA;US)
Forecasting electricity use in the service sector, 11:29974 (RA;US)
Regulations
Annual outlook for US electric power, 1986, 11:29945 (R;US)

ELECTRICAL EQUIPMENT
See also ANTENNAS
ELECTRIC CONTACTS
ELECTRICAL INSULATORS
ELECTROMAGNETS
TRANSFORMERS
Quality Assurance
Taking qualification requirements into account at the different levels of engineering. Nuclear qualification of electrical equipments, 11:29799 (R;FR;In French)

ELECTRICAL INSULATORS
Chemical Preparation
Method for the preparation of photochromic insulating crystals, 11:30171 (P;US)
Fabrication
Method for the preparation of photochromic insulating crystals, 11:30171 (P;US)
Optical Properties
Method for the preparation of photochromic insulating crystals, 11:30171 (P;US)

ELECTRICAL SURVEYS
Comparative Evaluations
Borehole geophysical techniques for defining permeable zones in geothermal systems, 11:29621 (RA;US)

ELECTRICITE DE FRANCE
Nuclear Power Plants
D.E.R. 84 panorama E.D.F. progress report, 11:29746 (R;FR;In French)
Research Programs
French study and research program on water cooled reactor safety, 11:29757 (R;FR;In French)

ELECTRIC-POWERED VEHICLES
See also HYBRID ELECTRIC-POWERED VEHICLES
Investigations of three-phase current drives for electric battery cars. Vol. 1. Fundamental principles, system studies and results of experimental studies, 11:30062 (R;DE;In German)
Aerodynamics
Systems approach to the aerodynamic design of electric and hybrid vehicles, 11:30068 (BA;GB)
Computer-Aided Design
Computer-aided design of electric and hybrid vehicles, 11:30065 (BA;GB)
Design
Systems approach to the aerodynamic design of electric and hybrid vehicles, 11:30068 (BA;GB)
Technological advances in vehicle design: electric and hybrid vehicles, 11:30064 (B;GB)
Electric Batteries
Examination of battery-related electric vehicle track and field measurements, 11:30058 (RA;US)
Generic battery model for electric and hybrid vehicle simulation performance prediction, 11:30067 (BA;GB)
Overview of rechargeable battery testing in the United States, 11:29884 (RA;US)
Rationale and methodology for group testing of electric vehicle batteries, 11:30051 (RA;US)
Requirements for EV-batteries and consequences for test procedures, 11:30050 (RA;US)
Simple methodology for obtaining battery discharge times (and vehicle ranges) for arbitrarily structured load profiles, 11:30061 (RA;US)
Test programs at the National Battery Test Laboratory, 11:29885 (RA;US)

Validity of cycle life bench test data in relation to real world in-vehicle testing, 11:30059 (RA;US)
Lead-Acid Batteries
Design, electric vehicle simulation program and duty cycle for a computer controlled bench test of lead-acid batteries, 11:30057 (RA;US)
Innovative on-board instrumentation for EV battery characterization, 11:30055 (RA;US)
Overview of Australian lead/acid battery test programs, 11:29879 (RA;US)
Performance testing of advanced lead-acid batteries for electric vehicles, 11:30053 (RA;US)
Rebirth of the lead-acid battery - meeting the electric vehicle challenges of the 1980s, 11:30066 (BA;GB)
Test and data reduction algorithm for the evaluation of lead-acid battery packs, 11:30052 (RA;US)
Testing of batteries in Germany, 11:29881 (RA;US)
Meetings
Technological advances in vehicle design: electric and hybrid vehicles, 11:30064 (B;GB)
Operation
Investigations of three-phase current drives for electric battery cars. Vol. 2. Simulation; theory and results, 11:30063 (R;DE;In German)
Performance Testing
Comparison of laboratory, dynamometer and road tests of an EV, 11:30060 (RA;US)
Range
Examination of battery-related electric vehicle track and field measurements, 11:30058 (RA;US)
Simple methodology for obtaining battery discharge times (and vehicle ranges) for arbitrarily structured load profiles, 11:30061 (RA;US)
Road Tests
Comparison of laboratory, dynamometer and road tests of an EV, 11:30060 (RA;US)
Simulation
Investigations of three-phase current drives for electric battery cars. Vol. 2. Simulation; theory and results, 11:30063 (R;DE;In German)
Sodium-Sulfur Batteries
Accelerated life testing of sodium-sulfur cells, 11:30054 (RA;US)
Design of the thermal management systems for NaS-traction-batteries by using battery models, 11:30056 (RA;US)
ELECTROCHEMICAL COATING
Numerical Analysis
Comparison of a boundary element and finite element solution of an electrochemical plating problem, 11:30328 (R;US)
ELECTRODEPOSITED COATINGS
Adhesion
Method of measuring metal coating adhesion, 11:30109 (P;US)
Destructive Testing
Method of measuring metal coating adhesion, 11:30109 (P;US)
ELECTRODES
See also ANODES
CATHODES
Current Density
Electrical characteristics of large-diameter discharge electrodes in electrostatic precipitators, 11:29718 (RA;US)
Design
Laboratory analysis of corona discharge electrodes and back corona phenomena, 11:29719 (RA;US)
Performance of large-diameter wires as discharge electrodes in electrostatic precipitators, 11:29716 (RA;US)
Erosion
Cesium transpiration through a negative-ion forming electrode, 11:31266 (BA;US)
Tokamak arc damage, 11:31005 (J;US)
Mathematical Models
Prediction of voltage-current curves for novel electrodes arbitrary wire electrodes on axis, 11:29699 (RA;US)
Morphology
Post-test analyses of Na/S cells and aqueous batteries, 11:29898 (RA;US)
Performance Testing
Performance of large-diameter wires as discharge electrodes in electrostatic precipitators, 11:29716 (RA;US)
Stresses
Weighted discharge electrodes - a solution to mechanical fatigue problems, 11:29743 (RA;US)
ELECTROLYTES
See also SOLID ELECTROLYTES
Coatings
Coated powder for electrolyte matrix for carbonate fuel cell, 11:29986 (P;US)
ELECTROMAGNETIC FIELDS
Biological Effects
Biological effects of electric fields: an overview, 11:30732 (BA;US)
Reviews
Biological effects of electric fields: an overview, 11:30732 (BA;US)
ELECTROMAGNETISM
Algebra
Comparison of Clifford and Grassmann algebras in applications to electromagnetics. Revision 1, 11:30959 (R;US)
Computerized Simulation
Evolving directions of PC applications in electromagnetics analysis and design, 11:31288 (R;US)
ELECTROMAGNETS
See also SUPERCONDUCTING MAGNETS
Mathematical Models
Low frequency electromagnetic field computation in three dimensions, 11:30329 (R;GB)
ELECTROMETERS
Performance
Rotor electrometer for fractional charge searches, 11:30499 (R;US)
Rotors
Rotor electrometer for fractional charge searches, 11:30499 (R;US)
ELECTRON ANTINEUTRINOS
Mass
Brief review on neutrino mass measurements, 11:30833 (RA;JP)
Electron antineutrino mass from the β-decay of ^{3}H, 11:30826 (RA;JP)
ELECTRON BEAM INDUCED CURRENT
See SCANNING ELECTRON MICROSCOPY
ELECTRON BEAM WELDING
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
ELECTRON CYCLOTRON-RESONANCE HEATING
See ECR HEATING
ELECTRON DENSITY
Spatial Distribution
Calculated electron density distributions in ScS and Sc_3S_4, 11:30205 (J;US)
ELECTRON DETECTION
Cherenkov Counters
Further measurements of electron transmission and avalanche gain in narrow lead glass tubing, 11:30461 (J;US)
Drift Chambers
Performance of the cylindrical drift chamber for the crystal box at LAMPF, 11:30491 (J;NL)
Multiwire Proportional Chambers
Charge division using carbon filaments for obtaining coordinate information from detection of single electrons, 11:30478 (J;US)
Shower Counters
Design and performance of a CCD based readout for the DELPHI barrel electromagnetic calorimeter, 11:30467 (J;US)
ELECTRON NEUTRINOS
See also ELECTRON ANTINEUTRINOS
Mass
Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho, 11:30834 (RA;JP)
Rest Mass
Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho, 11:30827 (RA;JP)
ELECTRON PARAMAGNETIC RESONANCE
See ELECTRON SPIN RESONANCE

ELECTRON SPIN RESONANCE
Data Analysis
Electron spin mapping of coal molecular structure by ENDOR. Quarterly technical progress report, 11:29181 (R;US)
Research Programs
Electron spin mapping of coal molecular structure by ENDOR. Quarterly technical progress report, 11:29181 (R;US)
ELECTRON TRANSFER
Not for CHARGE EXCHANGE.
Chemical Reaction Kinetics
Kinetics of one-electron transfer reactions involving ClO_3 and NO_3, 11:30204 (J;US)
ELECTRONIC CIRCUITS
See also PRINTED CIRCUITS
Noise Pollution Control
Noise isolation system for high-speed circuits, 11:30401 (P;US)
Optimization
Low-pass filters for signal averaging, 11:30399 (J;US)
Performance
Low-pass filters for signal averaging, 11:30399 (J;US)
ELECTRON-MOLECULE COLLISIONS
Electron Attachment
S-wave threshold in electron attachment - observations and cross sections in CCl4 and SF6 at ultralow electron energies, 11:30818 (J;US)
ELECTRON-POSITRON COLLISIONS
Multiple Production
Charged-particle multiplicity distributions in e^+e annihilation and negative binomial distributions, 11:30860 (R;XA)
Particle Production
New particle searches at e^+e machines, 11:30838 (R;FR)
ELECTRON-POSITRON INTERACTIONS
Particle Production
ASP: a search for single photon events at PEP, 11:30846 (R;US)
ELECTROPLATING
Control Systems
Control of precious metal plating baths using electrogravimetric analysis, 11:30330 (R;US)
ELECTROSTATIC PRECIPITATORS
Computerized Simulation
Microcomputer programs for precipitator performance estimates, 11:29696 (RA;US)
Current Density
Bipolar current probe for diagnosing full-scale precipitators, 11:29721 (RA;US)
Fluid dynamics of electrostatic precipitators: effects of electrode geometry, 11:29727 (RA;US)
Design
Comparison of US and Japanese practices in the specification and operation and maintenance of electrostatic precipitators, 11:29735 (RA;US)
High-temperature, high-pressure electrostatic precipitation, current status, 11:29685 (RA;US)
Optimizing the performance of a modern electrostatic precipitator by design refinements, 11:29742 (RA;US)
Reducing electrostatic precipitator power consumption, 11:29739 (RA;US)
Use of a mobile electrostatic precipitator for pilot studies, 11:29698 (RA;US)
Economics
Economics of electrostatic precipitators and fabric filters, 11:29689 (RA;US)
Efficiency
Measurement of the electrokinetic transport properties of particles in an electrostatic precipitator, 11:29744 (RA;US)
Electric Fields
Electrical characteristics of large-diameter discharge electrodes in electrostatic precipitators, 11:29718 (RA;US)
Static field strength in wire-plate electrostatic precipitators with profiled collecting electrodes by an experimental method, 11:29726 (RA;US)
Electric Potential
Numerical computation of the electrical conditions in a wire-plate electrostatic precipitator using the finite element technique, 11:29700 (RA;US)
Performance of large-diameter wires as discharge electrodes in electrostatic precipitators, 11:29716 (RA;US)
Energy Efficiency
Reducing electrostatic precipitator power consumption, 11:29739 (RA;US)
Static field strength in wire-plate electrostatic precipitators with profiled collecting electrodes by an experimental method, 11:29726 (RA;US)
Feasibility Studies
Charging of particulates by evaporating charged water droplets, 11:29694 (RA;US)
Pulsing on a cold-side precipitator: Florida Power Corporation, Crystal River, Unit 1, 11:29710 (RA;US)
Maintenance
Electrostatic precipitator EUS section failure: operation and maintenance, 11:29745 (RA;US)
Manuals
Operation and maintenance manuals for electrostatic precipitators and fabric filters, 11:29736 (RA;US)
Mathematical Models
Analysis of error in precipitator performance estimates, 11:29697 (RA;US)
Operation
Comparison of US and Japanese practices in the specification and operation and maintenance of electrostatic precipitators, 11:29735 (RA;US)
Electrostatic precipitator EUS section failure: operation and maintenance, 11:29745 (RA;US)
Operation and maintenance manuals for electrostatic precipitators and fabric filters, 11:29736 (RA;US)
Prediction of voltage-current curves for novel electrodes arbitrary wire electrodes on axis, 11:29699 (RA;US)
Use of a mobile electrostatic precipitator for pilot studies, 11:29698 (RA;US)
Optimization
Conditioning of power station flue gases to improve electrostatic precipitator efficiency, 11:29702 (RA;US)
Economics of electrostatic precipitators and fabric filters, 11:29689 (RA;US)
Estimating the benefits of SO_3 gas conditioning on the performance of utility precipitators when burning US coals, 11:29690 (RA;US)
Field study of a combined NH_3-SO_3 conditioning system on a cold-side fly ash precipitator at a coal-fired power plant, 11:29701 (RA;US)
Full scale experience with pulsed energization of electrostatic precipitators, 11:29708 (RA;US)
Laboratory and full-scale characteristics of electrostatic precipitators with rigid mast electrodes, 11:29707 (RA;US)
New life for old weighted wire precipitators: rebuilding with rigid electrodes, 11:29709 (RA;US)
Optimizing the collector sections of multi-stage electrostatic precipitators, 11:29712 (RA;US)
Optimizing the performance of a modern electrostatic precipitator by design refinements, 11:29742 (RA;US)
Pilot-scale study of a new method of flue-gas conditioning with ammonium sulfate, 11:29703 (RA;US)
Practical implications of pulse energization of electrostatic precipitators, 11:29706 (RA;US)
Precipitator performance enhancement with pulsed energization, 11:29714 (RA;US)
Pulse energization system of electrostatic precipitator for retrofitting application, 11:29705 (RA;US)
Weighted discharge electrodes - a solution to mechanical fatigue problems, 11:29743 (RA;US)
Performance
Acid rain control options - impact on precipitator performance, 11:29734 (RA;US)
Aerosol particle charging in a pulsed corona discharge, 11:29715 (RA;US)
Analysis of air heater - fly ash - sulfuric acid vapor interactions, 11:29723 (RA;US)

Critical electrostatic precipitator purchasing concepts, 11:29738 (RA;US)
Laboratory analysis of corona discharge electrodes and back corona phenomena, 11:29719 (RA;US)
Method for predicting the effective volume resistivity of a sodium depleted fly ash layer, 11:29722 (RA;US)
Microcomputer programs for precipitator performance estimates, 11:29696 (RA;US)
Microcomputer models for particulate control, 11:29691 (RA;US)
Particle charging with an electron beam precharger, 11:29693 (RA;US)
Technical evaluation of plate spacing effects on fly ash collection in precipitators, 11:29717 (RA;US)
Performance Testing
Analysis of error in precipitator performance estimates, 11:29697 (RA;US)
Field study of multi-stage electrostatic precipitators, 11:29711 (RA;US)
Test results of a precipitator operating at high-temperature and high-pressure conditions, 11:29686 (RA;US)
Quality Control
Critical electrostatic precipitator purchasing concepts, 11:29738 (RA;US)
Research Programs
Technical evaluation of plate spacing effects on fly ash collection in precipitators, 11:29717 (RA;US)
Retrofitting
Ceramic-made boxer-charger for precharging applications, 11:29713 (RA;US)
Pulse energization system of electrostatic precipitator for retrofitting application, 11:29705 (RA;US)
Removal of sulfur dioxide and particulate using E-SOX, 11:29733 (RA;US)
Space Charge
Experimental studies of space charge effects in an ESP, 11:29724 (RA;US)
Test Facilities
Electrostatic precipitator facility for turbulence research, 11:29725 (RA;US)
Turbulence
Electrostatic precipitator facility for turbulence research, 11:29725 (RA;US)

ELECTROSTATIC WAVES
See PLASMA WAVES

ELMO BUMPY TORUS
Fluctuations
Measurements of high frequency fluctuations in EBT, 11:31022 (BA;US)
Magnetohydrodynamics
The role of fusion reaction products in the stability of EBT reactors, 11:31167 (J;US)
Plasma Density
Preliminary neutral density measurements in EBT using a diagnostic neutral beam, 11:31013 (BA;US)
Plasma Diagnostics
Preliminary neutral density measurements in EBT using a diagnostic neutral beam, 11:31013 (BA;US)
Plasma Instability
The role of fusion reaction products in the stability of EBT reactors, 11:31167 (J;US)

ELMO DEVICES
See also ELMO BUMPY TORUS
Magnet Coils
Magnetics calculations for an ELMO Bumpy Square, 11:31180 (J;US)
Square Configuration
Assessment of magnetic field asymmetries in ELMO Bumpy Square, 11:31181 (J;US)
Magnetics calculations for an ELMO Bumpy Square, 11:31180 (J;US)

ELUTION (SOLUBLE CONSTITUENTS)
See LEACHING

EMERGENCIES
See ACCIDENTS

EMERGENCY CORE COOLING SYSTEM
See ECCS

EMPLOYEES
See PERSONNEL

END USE SECTOR
See COMMERCIAL SECTOR

ENDF
See NUCLEAR DATA COLLECTIONS

ENERGY
See also GEOTHERMAL ENERGY
SOLAR ENERGY
Environmental Effects
Summary report of the workshop on the interactions of climate and energy, 11:30520 (J;US)
Information Needs
National energy information system for Finland, 11:29917 (R;FI;In Finnish)
Information Systems
National energy information system for Finland, 11:29917 (R;FI;In Finnish)

ENERGY CONSUMPTION
Calculation Methods
Calculation of the consumption of electric energy in buildings, 11:29996 (R;FI;In Finnish)
Data Base Management
1975, 1976 Energy Consumption Data Base for the Industrial Sector. Volume 3. Computer-related documentation. Final report, 11:29948 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report, 11:29979 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report, 11:29980 (R;US)
Mathematical Models
Calculation of the consumption of electric energy in buildings, 11:29996 (R;FI;In Finnish)
Planning
Analysis of energy consumption in administrative buildings, 11:29991 (R;SE;In Swedish)

ENERGY EFFICIENCY
Standards
Analysis of energy conservation standards for Singapore office buildings, 11:30020 (J;GB)

ENERGY EXCHANGE
See ENERGY TRANSFER

ENERGY SOURCE DEVELOPMENT
Environmental Impacts
Potential responses of tundra ecosystems to perturbations from energy development. Part I. Annual report, 1983, 11:30591 (R;US)

ENERGY STORAGE
Computerized Simulation
Accumulators for the system of power plants delivering heat and electricity, 11:29877 (R;SE;In Swedish)

ENERGY TRANSFER
See also HEAT TRANSFER
Pressure Dependence
Effect of high pressure on critical concentration energy transport in isotopically mixed naphthalene crystals, 11:30255 (J;US)

ENGINEERED SAFETY SYSTEMS
See also CONTAINMENT SYSTEMS
ECCS
Reliability
Nuclear plant aging research program activities, 11:29833 (R;US)

ENGLAND
See UNITED KINGDOM

ENRICHMENT PLANTS (CENTRIFUGE)
See CENTRIFUGE ENRICHMENT PLANTS

ENVIRONMENT
Chirality
Weak neutral currents and the origin of biomolecular chirality, 11:30632 (J;GB)

ENVIRONMENTAL EXPOSURE CHAMBERS
See EXPOSURE CHAMBERS

ENVIRONMENTAL PROTECTION AGENCY
See US EPA

ENVIRONMENTAL TRANSPORT
See also RADIONUCLIDE MIGRATION
RUNOFF
Mathematical Models
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
EPA
See US EPA
EPITHELIUM
Intestinal Absorption
Peyer's patch epithelium: an imperfect barrier, 11:30684 (BA;US)
Membrane Transport
Peyer's patch epithelium: an imperfect barrier, 11:30684 (BA;US)
EPITHERMAL NEUTRONS
Multiplication Factors
Measurements and calculations of the leakage multiplication from hollow beryllium spheres, 11:31154 (J;US)
EPOXIDES
Chemical Preparation
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Chemical Reaction Kinetics
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Oxidation
Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)
Physical Radiation Effects
Effects of high energy radiation on the mechanical properties of epoxy-graphite fiber reinforced composites. Interim report, 1 January- 31 December 1985, 11:30145 (R;US)
EPOXY COMPOUNDS
See EPOXIDES
EPR
See ELECTRON SPIN RESONANCE
EQUIPMENT
Use of a more specific term is recommended.
See also CONTROL EQUIPMENT
DISTILLATION EQUIPMENT
DRILLING EQUIPMENT
ELECTRICAL EQUIPMENT
FIELD PRODUCTION EQUIPMENT
HARVESTING EQUIPMENT
HEAT RECOVERY EQUIPMENT
MATERIALS HANDLING EQUIPMENT
POLLUTION CONTROL EQUIPMENT
PORTABLE EQUIPMENT
WELL LOGGING EQUIPMENT
X-RAY EQUIPMENT
Testing
Qualification testing evaluation (QTE) program, FIN A-1051, Case 0686. Bimonthly status report, February-March 1986, 11:29797 (R;US)
ERBIUM 154
High Spin States
Study of transitional Erbium nuclei (N=86) at very high spin. Highlight of dipolar transitions and medium lifetimes in the continuum, 11:30909 (R;FR;In French)
ERYTHROBLASTS
See BONE MARROW CELLS
ESCHERICHIA COLI
Genetic Radiation Effects
Role of potassium-40 in evolutionary mutagenesis, 11:30699 (J;US)
Spontaneous Mutations
Role of potassium-40 in evolutionary mutagenesis, 11:30699 (J;US)
ESR
See ELECTRON SPIN RESONANCE
ESTRADIOL
Chemical Preparation
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
ESTUARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
ETHANE
Chemical Reactions
Hydrogen-atom abstraction from alkanes by OH. 2. Ethane, 11:30251 (J;US)
Deuteration
Hydrogen-atom abstraction from alkanes by OH. 2. Ethane, 11:30251 (J;US)
Oxidation
Chemical kinetics of hydrocarbon oxidation in gaseous detonations, 11:29489 (J;US)
Photolysis
Hydrogen-atom abstraction from alkanes by OH. 2. Ethane, 11:30251 (J;US)
Solubility
Phase behavior of coal fluids: data for correlation development. Report for the period: November 1, 1985-January 31, 1986, 11:29176 (R;US)
1,2-ETHANEDIOL
See GLYCOLS
ETHANOL FUELS
Use for pure ethanol, ethanol-water mixtures, or ethanol with additives; for ethanol-gasoline mixtures, use GASOHOL.
Exhaust Gases
Practical properties of ethanol used as a fuel in diesel engine supercharged in different ways, 11:30039 (R;FI;In Finnish)
Ignition Quality
Practical properties of ethanol used as a fuel in diesel engine supercharged in different ways, 11:30039 (R;FI;In Finnish)
ETHERS
Catalysis
In situ study of the hydrogenation of diphenyl ether in the presence of pyrrhotite and H_2S, 11:30257 (J;US)
ETHINE
See ACETYLENE
ETHIOPIA
Biomass Conversion Plants
Development of biogas technology in Ethiopia, 11:29471 (RA;DE)
Energy Policy
Ethiopia - energy situation 1984, 11:29933 (R;DE;In German)
Energy Supplies
Ethiopia - energy situation 1984, 11:29933 (R;DE;In German)
ETHNIC GROUPS
See MINORITY GROUPS
ETHOCEL
See CELLULOSE
ETHERS
ETHYLENE
Biological Effects
Ethylene and the growth of rice seedlings, 11:30676 (J;US)
Biosynthesis
Ethylene and the growth of rice seedlings, 11:30676 (J;US)
Chemical Reaction Kinetics
Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985, 11:30234 (R;US)
Chemical Reaction Yield
Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene, 11:30287 (J;US)
Combustion
Experimental investigation of the acceleration of deflagration in wake flow, 11:30323 (R;FR)
Intermittency and conditional velocities in premixed conical turbulent flames, 11:30324 (R;US)
Fluorescence
Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies, 11:30276 (J;US)
Oxidation
Chemical kinetics of hydrocarbon oxidation in gaseous detonations, 11:29489 (J;US)
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Photochemistry
Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies, 11:30276 (J;US)

Photolysis
Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene, 11:30287 (J;US)
Polymerization
Supported f-element complexes: surface chemistry and catalysis. Final report, August 15, 1984-January 14, 1986, 11:30195 (R;US)
Resonance Fluorescence
Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene, 11:30287 (J;US)
Rotation
Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies, 11:30276 (J;US)
ETHYLENE GLYCOL
See GLYCOLS
ETHYLENE POLYMERS
See POLYETHYLENES
ETHYLENEDIAMINETETRAACETIC ACID
See EDTA
ETHYNE
See ACETYLENE
EUROPE
Forests
Current state of forest decline in Central Europe, 11:30711 (RA;DE;In German)
Imports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
EUROPIUM COMPOUNDS
Separation Processes
Permeation of metal ions through a series of two complementary supported liquid membranes, 11:30187 (J;NL)
EVALUATED NUCLEAR DATA FILE
See NUCLEAR DATA COLLECTIONS
EVAPORATORS
Evaluation
Evaluation of the miscellaneous waste evaporator at Rancho Seco, 11:29389 (RA;US)
Heat Transfer
Vertical recirculation-type evaporators. An investigation of heat transfer and refrigerant circulation, 11:29989 (R;SE;In Swedish)
EVENT TREE ANALYSIS
See FAILURE MODE ANALYSIS
EXCHANGE (HEAT)
See HEAT TRANSFER
EXCHANGE (ION)
See ION EXCHANGE
EXHAUST GASES
Desulfurization
Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
Health Hazards
Role of inhalation studies with animals in defining human health risks for vehicle and power plant emissions, 11:29227 (J;US)
Measuring Methods
Exhaust gas analysis of a diesel engine using alcohol as a fuel, 11:30040 (R;FI;In Finnish)
Scrubbing
Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
EXPANSION JOINTS
Design
Rolling cuff flexible bellows, 11:29248 (P;US)
EXPLORATORY WELLS
Well Completion
Method for isolating two aquifers in a single borehole, 11:30405 (P;US)
EXPLOSIONS
See also CHEMICAL EXPLOSIONS
Computerized Simulation
On the adequacy of numerical codes for the simulation of vapour cloud explosions. Pt. 1, 11:30508 (R;FR)
Flame Propagation
Experimental investigation of the acceleration of deflagration in wake flow, 11:30323 (R;FR)
EXPLOSIVE FRACTURING
Blast Effects
Dust and pressure generated during commercial oil shale mine blasting, 11:29260 (BA;US)
Computerized Simulation
Evaluation of blast designs for in situ oil shale retorting, 11:29262 (BA;US)
Rock motion modeling of oil shale cratering experiments, 11:29264 (BA;US)
Rock Mechanics
Rock motion modeling of oil shale cratering experiments, 11:29264 (BA;US)
EXPOSURE CHAMBERS
Standards
Quantitative standard for exposure chamber integrity, 11:30554 (J;US)
EXTRACTION (SOLVENT)
See SOLVENT EXTRACTION
EXTREME ULTRAVIOLET RADIATION
Wavelength range 400-100 A.
Mirrors
Extreme ultraviolet multilayer reflectors, 11:30341 (R;US)
EXTREMELY HIGH FREQUENCY RADIATION
See MICROWAVE RADIATION

F

FABRIC FILTERS
Corrosion
Novel design concepts for an 860 MW fabric filter used with a dry flue gas desulfurization system, 11:29730 (RA;US)
Design
Novel design concepts for an 860 MW fabric filter used with a dry flue gas desulfurization system, 11:29730 (RA;US)
Economics
Economics of electrostatic precipitators and fabric filters, 11:29689 (RA;US)
Energy Efficiency
Hot-gas fabric filtration 500°F-1500°F - no Utopia but reality, 11:29695 (RA;US)
Maintenance
Air pollution control: maintenance cost savings from the washing, patching and reuse of bags used in fabric filters, 11:30406 (RA;US)
Manuals
Operation and maintenance manuals for electrostatic precipitators and fabric filters, 11:29736 (RA;US)
Modifications
Update of the performance of the Cromby Station fabric filter, 11:29737 (RA;US)
Operation
Fabric filter operation downstream of a spray dryer: pilot and full-scale results, 11:29729 (RA;US)
Operation and maintenance manuals for electrostatic precipitators and fabric filters, 11:29736 (RA;US)
Start-up and operating experience with a reverse air fabric filter as part of the University of Minnesota dry FGD system, 11:29194 (RA;US)
Optimization
Economics of electrostatic precipitators and fabric filters, 11:29689 (RA;US)
Performance
Update of the performance of the Cromby Station fabric filter, 11:29737 (RA;US)
Performance Testing
Development and high temperature application of a novel method for measuring ash deposits and cake removal on filter bags, 11:29688 (RA;US)
FACILITIES (EDUCATIONAL)
See EDUCATIONAL FACILITIES

FACILITIES (NUCLEAR)
See NUCLEAR FACILITIES
FACILITIES (STORAGE)
See STORAGE FACILITIES
FACILITIES (TEST)
See TEST FACILITIES
FAILURE MODE ANALYSIS
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
FALLOUT
For radioactive fallout only.
Biological Localization
Retention of simulated fallout particles by lichens and mosses, 11:30587 (J;US)
Environmental Transport
Retention of simulated fallout particles by lichens and mosses, 11:30587 (J;US)
Uptake
Retention of simulated fallout particles by lichens and mosses, 11:30587 (J;US)
FALLOUT PARTICULATES
See FALLOUT PARTICLES
FARADAY GENERATORS
See MHD GENERATORS
FARMS
Biomass Conversion Plants
Experiences with a low temperature biogas plant, 11:29479 (RA;DE)
FAST FLUX TEST FACILITY REACTOR
See FFTF REACTOR
FAST MAGNETOACOUSTIC WAVES
Wave Propagation
Alpha-driven fast magnetosonic wave heating in tokamak plasmas, 11:31007 (J;US)
FAST NEUTRONS
Absorption
Transmission of fast neutrons through an iron sphere, 11:31091 (J;US)
FASTBUS SYSTEM
Alarm Systems
FASTBUS rack alarms and limits, 11:30465 (J;US)
Cooling
FASTBUS cooling, 11:30466 (J;US)
Design
A FASTBUS logic analyzer based on SLAC SNOOP diagnostic modules, 11:30464 (J;US)
FASTBUS cooling, 11:30466 (J;US)
The FASTBUS Segment Extension as a crate coupling concept, 11:30463 (J;US)
Performance Testing
A FASTBUS logic analyzer based on SLAC SNOOP diagnostic modules, 11:30464 (J;US)
Programming
The FASTBUS Segment Extension as a crate coupling concept, 11:30463 (J;US)
Reviews
FASTBUS review 1985, 11:30435 (J;US)
Specifications
FASTBUS review 1985, 11:30435 (J;US)
Uses
FASTBUS review 1985, 11:30435 (J;US)
FASTENERS
Design
Metal-to-ceramic attachment device, 11:30110 (P;US)
FEDERAL REGION I
Prior to June 1982 this concept was indexed to NORTH ATLANTIC REGION.
See also MASSACHUSETTS
NEW HAMPSHIRE
Air Pollution Monitoring
Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
FEDERAL REGION V
Prior to June 1982 this concept was indexed to GREAT LAKES REGION.
See also ILLINOIS
INDIANA
Hot-Dry-Rock Systems
Exploration for Hot Dry Rock geothermal resources in the Midcontinent USA. Volume 1. Introduction, geologic overview, and data acquisition and evaluation, 11:29622 (R;US)
FEDERAL REGION VI
Prior to June 1982 this concept was indexed to SOUTHWEST REGION.
See also TEXAS
Hot-Dry-Rock Systems
Exploration for Hot Dry Rock geothermal resources in the Midcontinent USA. Volume 1. Introduction, geologic overview, and data acquisition and evaluation, 11:29622 (R;US)
FEDERAL REGION VII
Prior to June 1982 this concept was indexed to MIDWEST REGION.
See also IOWA
MISSOURI
Air Quality
A case study of the effects of local and distant sources of alkaline material on precipitation in the midwest and plains, 11:30550 (J;US)
Hot-Dry-Rock Systems
Exploration for Hot Dry Rock geothermal resources in the Midcontinent USA. Volume 1. Introduction, geologic overview, and data acquisition and evaluation, 11:29622 (R;US)
FEDERAL REGION X
Prior to June 1982 this concept was indexed to PACIFIC NORTHWEST REGION.
See also IDAHO
OREGON
WASHINGTON
Diffuse Solar Radiation
Pacific Northwest Solar Radiation Data, 11:29497 (R;US)
Direct Solar Radiation
Pacific Northwest Solar Radiation Data, 11:29497 (R;US)
FEDERAL REPUBLIC OF GERMANY
Air Pollution Control
Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
Commercial Sector
Data on energy use in the commercial sector of the Federal Republic of Germany, 11:29961 (RA;US)
Forests
Comparison of the methods of survey adopted in the Federal Republic of Germany and Austria, 11:30713 (RA;DE;In German)
Conspectus of the results of the 1984 inventory on forest decline, 11:30705 (RA;DE;In German)
Current damage situation in Bavaria, 11:30706 (RA;DE;In German)
Current damage situation in Baden-Wuerttemberg, 11:30707 (RA;DE;In German)
Current damage situation in Hesse, 11:30708 (RA;DE;In German)
Current damage situation in North-Rhine-Westphalia, 11:30709 (RA;DE;In German)
Forest damage in Lower Saxony, 11:30710 (RA;DE;In German)
Reflections regarding the further development of forest decline inventories for large areas, 11:30712 (RA;DE;In German)
State of forest decline in the Federal Republic of Germany. Vol. 1, 11:30704 (R;DE;In German)
Nuclear Power Plants
Advanced German Operator Support Systems, 11:29871 (J;US)
Radioactive Waste Facilities
Conceptual design for the injection of tritiated effluents into deep geological formations, 11:29361 (RA;US)
Radioactive Waste Processing
Cementation of radioactive wastes in the Federal Republic of Germany, 11:29377 (RA;US)

Service Sector
Trends of electricity consumption in the small consumers' sector of the Federal Republic of Germany, 11:29955 (RA;US)

FEDERATION OF MALAYA
See MALAYSIA

FEED MATERIALS PRODUCTION CENTER
Aerial Monitoring
Aerial radiological survey of the Feed Materials Production Center and surrounding area, Fernald, Ohio. Date of survey: April 1985, 11:30583 (R;US)
Radiation Monitoring
Aerial radiological survey of the Feed Materials Production Center and surrounding area, Fernald, Ohio. Date of survey: April 1985, 11:30583 (R;US)

FEEDBACK
Equivalent Circuits
Comparison of the domain and frequency domain state feedbacks, 11:30392 (R;US)

FEEDWATER
Chemical Analysis
Water chemistry control and analytical methods at medium pressure power plants, 11:29676 (R;FI;In Finnish)
Water Treatment
Water chemistry control and analytical methods at medium pressure power plants, 11:29676 (R;FI;In Finnish)

FELIX FACILITY
Crossed Fields
The Felix experiments: measurements of electromagnetic effects, 11:31164 (J;US)
Eddy Currents
The Felix experiments: measurements of electromagnetic effects, 11:31164 (J;US)
Electromagnetic Fields
The Felix experiments: measurements of electromagnetic effects, 11:31164 (J;US)

FERRIC COMPOUNDS
See IRON COMPOUNDS

FERRITIC STEELS
Fracture Properties
Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22} n/cm^2, 11:31060 (RA;US)
Impact Strength
Effect of nickel content on the aging and irradiation response of impact properties of 9 Cr-1 MoVNb and 12 Cr-1 MoVW in the absence of internal helium effects, 11:31061 (RA;US)
Materials Testing
Development of ferritic steels for reduced activation: the US program, 11:30081 (R;US)
Microhardness
Development of ferritic steels for fast induced-radioactivity decay, 11:31063 (RA;US)
Microstructure
Development of ferritic steels for fast induced-radioactivity decay, 11:31063 (RA;US)
Microstructural examination of several commercial alloys neutron irradiated to 100 dpa, 11:31034 (RA;US)
Optimization
Design of tough ferritic steels for cryogenic use, 11:30100 (R;US)
Physical Radiation Effects
Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22} n/cm^2, 11:31060 (RA;US)
Effect of nickel content on the aging and irradiation response of impact properties of 9 Cr-1 MoVNb and 12 Cr-1 MoVW in the absence of internal helium effects, 11:31061 (RA;US)
Effects of irradiation on low activation ferritic alloys, 11:31062 (RA;US)
Ion damage microstructures in a Fe-10Cr-6Mo-0.5Nb ferritic steel, 11:30087 (R;US)
Microstructural examination of several commercial alloys neutron irradiated to 100 dpa, 11:31034 (RA;US)
Tensile Properties
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)

FERROUS COMPOUNDS
See IRON COMPOUNDS

FERTILIZATION
Efficiency
Fertilization with peat and wood ashes - effects on biomass production, nutrient balance and uptake of heavy metals, 11:29547 (R;SE;In Swedish)

FERTILIZERS
Demonstration Programs
New developments in fertilizer technology, 11:30688 (R;US)
Test-demonstration in northern New Mexico. Progress report, 11:30687 (R;US)
Research Programs
National Fertilizer Development Center progress 84, 11:30686 (R;US)

FFTF REACTOR
Westinghouse Hanford Company, Richland, Washington
Irradiation Procedures
Test matrices for irradiation of Path A Prime Candidate and developmental alloys in FFTF, 11:31046 (RA;US)
Neutron Flux
FFTF fusion irradiations - FFTF cycles 4-6, 11:31045 (RA;US)
Test matrices for irradiation of Path A Prime Candidate and developmental alloys in FFTF, 11:31046 (RA;US)

FIELD PRODUCTION EQUIPMENT
Cost
Costs and indices for domestic oil and gas field equipment and production operations, 1985, 11:29245 (R;US)

FIELDS (ELECTROMAGNETIC)
See ELECTROMAGNETIC FIELDS

FIELDS (MAGNETIC)
See MAGNETIC FIELDS

FILTERS
See also FABRIC FILTERS
MECHANICAL FILTERS
Operation
Operational experiences of non-precoated type filters (super fine filter) in PWR and BWR nuclear power plants, 11:29812 (RA;US)
Optimization
Low-pass filters for signal averaging, 11:30399 (J;US)
Performance
Low-pass filters for signal averaging, 11:30399 (J;US)

FINLAND
Information Systems
National energy information system for Finland, 11:29917 (R;FI;In Finnish)
Wood Fuels
Utilization of chipwood in Lapland. Prehandling, 11:29491 (R;FI;In Finnish)

FIRE STATIONS
See PUBLIC BUILDINGS

FIREDAMP
See METHANE

FIRES
Mathematical Models
Literature review of fire modelling techniques and related subjects, 11:29865 (R;GB)

FIREWOOD
See WOOD FUELS

FIRST WALL
Design
First wall and blanket design for a high wall loading compact tokamak power reactor, 11:31151 (J;US)
Elasticity
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)
Gas Production Rates
Neutronics scaling in fusion test devices, 11:31156 (J;US)
Materials Testing
Vanadium alloys for fusion reactor first wall application, 11:30089 (R;US)
Neutronic Damage Functions
Neutronics calculations in support of the ORR-MFE-4A and -4B spectral tailoring experiments, 11:31043 (RA;US)
Physical Radiation Effects
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)

Neutronics scaling in fusion test devices, 11:31156 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)
Plasticity
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)
Scaling Laws
Neutronics scaling in fusion test devices, 11:31156 (J;US)
Stress Analysis
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)
Temperature Effects
Neutronics scaling in fusion test devices, 11:31156 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)

FISHES
See also ANADROMOUS FISHES
TROUT
Radionuclide Kinetics
Experimental investigation of cobalt-60 accumulation and elimination in Cyprinus carpio (L.), 11:30690 (R;FR;In French)

FISHING INDUSTRY
Energy Consumption
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report, 11:29979 (R;US)

FISSION
Evaluated Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Experimental Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Theoretical Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)

FISSION FRAGMENTS
Angular Momentum
Angular momentum partition in heavy ion induced fission and the effects of shells on gamma-ray multiplicities, 11:30914 (R;AU)

FISSION PRODUCT RELEASE
Coordinate with descriptors for the area of release such as BIOSPHERE or COOLANTS, and for the specific fission products, if known.
Environmental Transport
Assessment of the dispersion of fission products in the atmosphere following a reactor accident under meteorological conditions of low wind speeds with or without high temporal and spatial variability in wind speed and direction, 11:30559 (R;FR)

FISSION PRODUCTS
Beta Decay
Attempt for revision of JNDC FP Decay Data File, 11:30913 (R;JP)
Containment Systems
Fission gas detection system, 11:29875 (P;US)
Energy-Level Transitions
Attempt for revision of JNDC FP Decay Data File, 11:30913 (R;JP)
Mechanical Filters
Fission gas detection system, 11:29875 (P;US)
Nuclear Data Collections
Attempt for revision of JNDC FP Decay Data File, 11:30913 (R;JP)

FISSIONABLE MATERIALS MANAGEMENT
See NUCLEAR MATERIALS MANAGEMENT

FISSURED FORMATIONS
See FRACTURED RESERVOIRS

FIXATION (CARBON DIOXIDE)
See CARBON DIOXIDE FIXATION

FIXED BED
See PACKED BED

FLAME PROPAGATION
Mathematical Models
Prediction of heat release effects on a mixing layer, 11:30327 (BA;US)
Turbulence
Experimental investigation of the acceleration of deflagration in wake flow, 11:30323 (R;FR)

FLAMES
Heat Transfer
Thermal radiation hazard ranges from large hydrocarbon pool fires, 11:30563 (R;GB)
Turbulence
Intermittency and conditional velocities in premixed conical turbulent flames, 11:30324 (R;US)
Velocity
Intermittency and conditional velocities in premixed conical turbulent flames, 11:30324 (R;US)

FLASKS
See CASES

FLAT MAGNETIC SPECTROMETERS
Performance
CALLIOPE - a large acceptance multiparticle magnetic spectrometer for intermediate energy physics, 11:30490 (J;NL)

FLAT PLATE COLLECTORS
Efficiency
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)
Materials
Solar collectors for building applications, 11:29587 (RA;US)
Operation
Solar collectors for building applications, 11:29587 (RA;US)
Research Programs
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)

FLORIDA
Fuel Consumption
Energy data, 1970-1984, 11:29920 (R;US)
Renewable Energy Sources
Energy data, 1970-1984, 11:29920 (R;US)

FLOTATION
Reagents
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Yields
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)

FLOW BLOCKAGE
Experimental investigation of the effect of clad ballooning on the effectiveness of PWR emergency cooling, 11:29839 (R;FR)

FLOW (FLUID)
See FLUID FLOW

FLOWMETERS
Acoustic Measurements
Sidetone generator flowmeter, 11:30502 (P;US)
Design
Sidetone generator flowmeter, 11:30502 (P;US)

FLUE GAS
Cleaning
Conditioning of power station flue gases to improve electrostatic precipitator efficiency, 11:29702 (RA;US)
Pilot-scale study of a new method of flue-gas conditioning with ammonium sulfate, 11:29703 (RA;US)
Desulfurization
Design and operation of the baghouse at Holcomb Station, Unit No. 1, 11:29732 (RA;US)
Experience from wet/dry desulfurization in Sweden, 11:29197 (R;SE)
Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
Modeling of SO_2 removal in spray-dryer flue-gas desulfurization system, 11:29193 (RA;US)
Novel design concepts for an 860 MW fabric filter used with a dry flue gas desulfurization system, 11:29730 (RA;US)

Start-up and operating experience with a reverse air fabric filter as part of the University of Minnesota dry FGD system, 11:29194 (RA;US)
Heat Recovery
Comparison of dry injection systems at normal and high flue gas temperatures, 11:29195 (RA;US)
Director fired absorption machine flue gas recuperator, 11:30030 (P;US)
FLUID FLOW
See also GAS FLOW
INCOMPRESSIBLE FLOW
SOLIDS FLOW
SUPERSONIC FLOW
TWO-PHASE FLOW
VISCOUS FLOW
Computerized Simulation
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume I. Equations and numerics, 11:29800 (R;US)
Mixing
Modeling of convective mixing downstream of separately heated annuli, 11:30378 (R;US)
FLUID MECHANICS
See also AERODYNAMICS
Computer Calculations
Proceedings of the 2nd NAL symposium on aircraft computational aerodynamics, 11:30325 (R;JP)
Computerized Simulation
Development of computational fluid dynamics at NASA Ames Research Center, 11:30381 (RA;JP)
Meetings
Proceedings of the 2nd NAL symposium on aircraft computational aerodynamics, 11:30325 (R;JP)
FLUIDIZED BED BOILERS
Comparative Evaluations
Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
Economics
Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
FLUIDIZED-BED COMBUSTION
Comparative Evaluations
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Correlations
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Demonstration Plants
Atmospheric FBC and CFBC - the American approach, 11:29221 (R;SE)
Pressurized-fluidized bed combustion (PFBC) - coal power for the future, 11:29223 (R;SE)
Performance Testing
Pressurized-fluidized bed combustion (PFBC) - coal power for the future, 11:29223 (R;SE)
Pilot Plants
Atmospheric FBC and CFBC - the American approach, 11:29221 (R;SE)
Technology Assessment
Assessment of atmospheric fluidised bed combustion techniques, 11:29219 (R;GB)
Atmospheric FBC and CFBC - the American approach, 11:29221 (R;SE)
Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
FLUIDIZED-BED COMBUSTORS
Corrosion
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Erosion
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Performance Testing
Progress in circulating fluidized bed firing for steam generation and use of low value fuels and coals, 11:29218 (R;FR;In German)
FLUIDS
Not for BODY FLUIDS.
See also FRACTURING FLUIDS
GASES
GEOTHERMAL FLUIDS
LIQUIDS
Neutron Transport
Collective motions in dense fluids observed in neutron scattering, 11:30949 (R;GB)
FLUORESCENCE
Decay
Potentiometric titration of Photosystem II fluorescence decay kinetics in spinach chloroplasts, 11:30642 (J;NL)
FLUORESCENT LAMPS
Design
Magnetic fluorescent lamp having reduced ultraviolet self absorption, 11:30402 (P;US)
FLUORINE
Activation Energy
$F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
Atom-Molecule Collisions
$F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
Chemical Reaction Kinetics
$F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
Quantitative Chemical Analysis
Fluorine in Colorado oil shale, 11:29276 (BA;US)
FLUORINE 18
Radiochemistry
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
FLUORINE BROMIDES
See BROMINE FLUORIDES
FLUORINE COMPOUNDS
Molecular Structure
Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON, 11:30211 (J;US)
Normal-Mode Analysis
Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON, 11:30211 (J;US)
FLUORINE FLUORIDES
See FLUORINE
FLUOROURACILS
Chemical Preparation
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
FLUX DENSITY
Use in coordination with the flux considered, e.g. MAGNETIC FLUX, NEUTRON FLUX, etc.
Biological Effects
Effects of quantum flux density of photosynthesis and chloroplast ultrastructure in tissue-cultured plantlets and seedlings of Liquidambar styraciflua L. towards improved acclimatization and field survival, 11:30679 (J;US)
FLY ASH
Air Pollution Control
Analysis of error in precipitator performance estimates, 11:29697 (RA;US)
Precipitator performance enhancement with pulsed energization, 11:29714 (RA;US)
Technical evaluation of plate spacing effects on fly ash collection in precipitators, 11:29717 (RA;US)
Test results of a precipitator operating at high-temperature and high-pressure conditions, 11:29686 (RA;US)
Chemical Composition
Influence of carbonaceous particles on the interaction of coal combustion stack ash with organic matter, 11:29185 (J;US)
Method for predicting the effective volume resistivity of a sodium depleted fly ash layer, 11:29722 (RA;US)
Study of the conditions of formation and emission of trace element pollutants from the combustion of coal in industrial fires, 11:29199 (R;XE)
Fractionation
Influence of carbonaceous particles on the interaction of coal combustion stack ash with organic matter, 11:29185 (J;US)

Leaching
Study of the conditions of formation and emission of trace element pollutants from the combustion of coal in industrial fires, 11:29199 (R;XE)
Materials Handling
Design considerations to avoid common fly ash conveying problems, 11:29740 (RA;US)
Particle Size
Aerosol formation from pulverized coal combustion. Final technical report, 11:29186 (R;US)
FOAMS
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
FOG (SPRAYS)
See SPRAYS
FOLIAGE
See LEAVES
FOOD CHAINS
Environmental Exposure Pathway
Use of the food-chain model FOOD III and the soil model SCEMR to assess irrigation as a biosphere pathway, 11:30579 (R;CA)
Mathematical Models
Use of the food-chain model FOOD III and the soil model SCEMR to assess irrigation as a biosphere pathway, 11:30579 (R;CA)
FOOD IRRADIATION
See FOOD PROCESSING
FOOD PROCESSING
Irradiation
Food irradiation: a technology for the eighties, 11:29455 (R;FR)
Mutagen Screening
Identification of mutagens from the cooking of food, 11:30726 (BA;US)
FORECASTING
Comparative Evaluations
Annual outlook for US coal 1986, with projections to 1995 (USA; to 1995), 11:29226 (R;US)
Prices
Annual outlook for US coal 1986, with projections to 1995 (USA; to 1995), 11:29226 (R;US)
FOREST LITTER
Natural organic debris on the forest floor.
Decomposition
Effects of pesticide on biota and breakdown of forest litter, 11:30703 (BA;RO)
Loss of weight, ^{60}Co, and ^{137}Cs from tree litter in three subsystems of a watershed, 11:30588 (J;US)
Mineralization
External factors influencing mineralization and immobilization of some radionuclides from tree litter, 11:30576 (BA;XA)
Radionuclide Migration
Behavior of ^{137}Cs-tagged particles in a fescue meadow, 11:30701 (BA;XA)
FORESTRY
Energy Consumption
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report, 11:29979 (R;US)
FORESTS
Computerized Simulation
Forecasting effects of SO_2 pollution on growth and succession in a western conifer forest, 11:30728 (J;US)
Integrating forest-stand simulations with paleoecological records to examine long-term forest dynamics, 11:30574 (BA;SE)
Damage
Comparison of the methods of survey adopted in the Federal Republic of Germany and Austria, 11:30713 (RA;DE;In German)
Conspectus of the results of the 1984 inventory on forest decline, 11:30705 (RA;DE;In German)
Current damage situation in Bavaria, 11:30706 (RA;DE;In German)
Current damage situation in Baden-Wuerttemberg, 11:30707 (RA;DE;In German)
Current damage situation in Hesse, 11:30708 (RA;DE;In German)
Current damage situation in North-Rhine-Westphalia, 11:30709 (RA;DE;In German)
Current state of forest decline in Central Europe, 11:30711 (RA;DE;In German)
Forest damage in Lower Saxony, 11:30710 (RA;DE;In German)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Reflections regarding the further development of forest decline inventories for large areas, 11:30712 (RA;DE;In German)
State of forest decline in the Federal Republic of Germany. Vol. 1, 11:30704 (R;DE;In German)
Swiss forest damage inventory of 1984, 11:30714 (RA;DE;In German)
Europe
Current state of forest decline in Central Europe, 11:30711 (RA;DE;In German)
Inventories
Comparison of the methods of survey adopted in the Federal Republic of Germany and Austria, 11:30713 (RA;DE;In German)
State of forest decline in the Federal Republic of Germany. Vol. 1, 11:30704 (R;DE;In German)
Mathematical Models
Forecasting effects of SO_2 pollution on growth and succession in a western conifer forest, 11:30728 (J;US)
Regional Analysis
Current damage situation in Bavaria, 11:30706 (RA;DE;In German)
Current damage situation in Baden-Wuerttemberg, 11:30707 (RA;DE;In German)
Current damage situation in Hesse, 11:30708 (RA;DE;In German)
Current damage situation in North-Rhine-Westphalia, 11:30709 (RA;DE;In German)
Forest damage in Lower Saxony, 11:30710 (RA;DE;In German)
FORMATES
Decomposition
Improved coal conversion in CO/water systems. Quarterly report No. 5, September 4, 1985-December 3, 1985, 11:29163 (R;US)
FORMIC ACID
Chemical Reactions
Gas evolution oscillators. 6. Quantitative characterization of an experimental system, 11:30262 (J;US)
FORMOSA
See TAIWAN
FOSSIL-FUEL POWER PLANTS
Air Pollution
Acid smut emission problems associated with Tufts Cove Generating Station, 11:29683 (RA;US)
Carbon particulate reduction evaluation for oil-fired utility boilers, 11:29684 (RA;US)
NO/sub x/ control efforts increase, 11:30624 (RA;US)
Air Pollution Abatement
Coal cleaning as an acid rain mitigation strategy: an in-depth examination, 11:29214 (J;US)
Air Pollution Control
Coal power plant in Japan, especially in EPDC's case with advanced combustion and cleaning technique, 11:29678 (R;SE)
Optimizing the collector sections of multi-stage electrostatic precipitators, 11:29712 (RA;US)
Coal Preparation
Coal cleaning as an acid rain mitigation strategy: an in-depth examination, 11:29214 (J;US)
Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)

Environmental Effects
Assessing environmental effects of oil-fuelled energy systems, 11:30527 (R;IT)
Fuel Oils
Experience in switching to heavier fuel oils, 11:29240 (RA;US)
Overview of EPRI residual fuel oil combustion project plans, 11:29241 (RA;US)
Overview of EPRI residual fuel oil quality criteria project plan, 11:29674 (RA;US)
Fuels
Controlling compatibility of residual fuel oils, 11:29239 (RA;US)
Materials
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Materials Testing
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Operating Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)
Quality Control
Controlling compatibility of residual fuel oils, 11:29239 (RA;US)
Research Programs
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

FRACTURE MECHANICS
Some novel concepts in fracture mechanics, 11:30359 (J;IN)
Computerized Simulation
Analysis of triaxial testing using a fracture damage model, 11:30386 (R;US)

FRACTURED FORMATIONS
See FRACTURED RESERVOIRS

FRACTURED RESERVOIRS
Fluid Flow
Multiple-porosity method for simulation of naturally fractured petroleum reservoirs, 11:29235 (R;US)
Rock-Fluid Interactions
Geological and geochemical techniques for fracture definition in geothermal reservoirs, 11:29640 (RA;US)
Simulation
Multiple-porosity method for simulation of naturally fractured petroleum reservoirs, 11:29235 (R;US)

FRACTURING FLUIDS
Transport
Quasi-static and dynamic arbitrary fracture propagation in jointed rock, 11:29252 (R;US)

FRAGMENTS (FALLOUT)
See FALLOUT

FRAGMENTS (FISSION)
See FISSION FRAGMENTS

FRAGMENTS (PARTICLES)
See PARTICLES

FRANCE
Energy Policy
France - energy situation 1984, 11:29926 (R;DE;In German)
Energy Supplies
France - energy situation 1984, 11:29926 (R;DE;In German)
Research Programs
French study and research program on water cooled reactor safety, 11:29757 (R;FR;In French)
Seasonal Thermal Energy Storage
STES newsletter: a quarterly review of seasonal thermal energy storage, 11:29988 (J;US)
Service Sector
Electricity in the service sector of France, 11:29953 (RA;US)

FRANCIUM 211
High Spin States
Spectroscopy of high spin states in sup(211,212,213)Fr, 11:30922 (R;AU)

FRANCIUM 212
High Spin States
Spectroscopy of high spin states in sup(211,212,213)Fr, 11:30922 (R;AU)

FRANCIUM 213
High Spin States
Spectroscopy of high spin states in sup(211,212,213)Fr, 11:30922 (R;AU)

FREE ELECTRON LASERS
Electromagnetic Radiation
Comparative study of free electron laser experiments in longitudinal and transverse wiggler geometries, 11:31070 (RA;JP)
Gain
Gain physics of rf-linac-driven xuv free-electron lasers, 11:30363 (R;US)
Mathematical Models
Transverse correlations in start-up of a free electron laser from noise, 11:30361 (R;US)
Research Programs
Evolution of free-electron laser development, 11:30362 (R;US)
Uses
Evolution of free-electron laser development, 11:30362 (R;US)

FREE RADICALS
See RADICALS

FRESH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS

FTR REACTOR (RICHLAND)
See FFTF REACTOR

FUEL ADDITIVES
Ignition Quality
Practical properties of alcohol mixtures containing ignition improver when used as a fuel in diesel engines, 11:30037 (R;FI;In Finnish)

FUEL ASSEMBLIES
See also FUEL ELEMENT CLUSTERS
Design
Fuel assembly for the production of tritium in light water reactors, 11:29755 (P;US)
Ducts
Mechanically attached load pad for liquid metal nuclear reactor fuel assemblies, 11:29782 (P;US)
Fluid Flow
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume I. Equations and numerics, 11:29800 (R;US)
Fuel Racks
Mechanically attached load pad for liquid metal nuclear reactor fuel assemblies, 11:29782 (P;US)
Heat Transfer
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume I. Equations and numerics, 11:29800 (R;US)
Impact Strength
Structural analysis of PWR fuel assemblies in LOCA and seismic conditions, 11:29770 (R;FR)
Post-Irradiation Examination
Field tests and examinations in cell of French fuel assemblies, 11:29758 (R;FR;In French)

FUEL BUNDLES
See FUEL ELEMENT CLUSTERS

FUEL CANS
Shape
Assessment of the use of half-square cans on the management of spent fuel, 11:29301 (R;US)
Weldability
Welding of sule elements for nuclear reactors with solid state YAG laser using instrumentated testing equipments, 11:30075 (R;FR;In French)

FUEL CELLS
Anodes
Fuel cell having dual electrode anode or cathode, 11:29904 (P;US)
Cathodes
Fuel cell having dual electrode anode or cathode, 11:29904 (P;US)

Design
Fuel cell having dual electrode anode or cathode, 11:29904 (P;US)
Electrochemistry
Fuel cell having dual electrode anode or cathode, 11:29904 (P;US)
FUEL COOLING INSTALLATIONS
See SPENT FUEL STORAGE
FUEL ELEMENT CLUSTERS
Flow Blockage
Experimental investigation of the effect of clad ballooning on the effectiveness of PWR emergency cooling, 11:29839 (R;FR)
FUEL ELEMENTS
See also ANNULAR FUEL ELEMENTS
FUEL PINS
FUEL RODS
SPENT FUEL ELEMENTS
Corrosion
High resolution in situ ultrasonic corrosion monitor, 11:29807 (P;US)
Rail Transport
TMI-2 spent fuel shipping, 11:29297 (RA;US)
FUEL GAS
See also HIGH BTU GAS
NATURAL GAS
Cleaning
Combined cycle process with integrated gasification VEW-Coal Conversion Process, 11:29679 (R;SE)
Combustion
Combined cycle process with integrated gasification VEW-Coal Conversion Process, 11:29679 (R;SE)
FUEL INJECTION SYSTEMS
Nozzles
Alcohol as a fuel in a high speed diesel engine with double injection system, 11:30041 (R;FI;In Finnish)
FUEL OILS
Chemical Properties
Overview of EPRI residual fuel oil quality criteria project plan, 11:29674 (RA;US)
Combustion Properties
Carbon particulate reduction evaluation for oil-fired utility boilers, 11:29684 (RA;US)
Physical Properties
Overview of EPRI residual fuel oil quality criteria project plan, 11:29674 (RA;US)
FUEL PENCILS
See FUEL PINS
FUEL PINS
Head End Processes
Head-end and solvent extraction studies using fast-flux test facility fuel, 11:29292 (R;US)
Loading
Funnel for fuel pin loading system, 11:29808 (P;US)
Remote Handling
Funnel for fuel pin loading system, 11:29808 (P;US)
FUEL RACKS
Design
Mechanically attached load pad for liquid metal nuclear reactor fuel assemblies, 11:29782 (P;US)
FUEL REPROCESSING PLANTS
Liquid Wastes
Solidification of enriched tritium from reprocessing, 11:29402 (R;DE;In German)
FUEL ROD CONSOLIDATION
See FUEL RACKS
FUEL RODS
After-Heat Removal
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Fabrication
Fabrication and loading of fuel rods for the Light Water Breeder Reactor (LWBR Development Program), 11:29781 (R;US)
Failed Element Detection
Fission gas detection system, 11:29875 (P;US)
Fission Products
Fission gas detection system, 11:29875 (P;US)
Heat Transfer
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
Hydraulics
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
Loading
Fabrication and loading of fuel rods for the Light Water Breeder Reactor (LWBR Development Program), 11:29781 (R;US)
FUEL SHEATHS
See FUEL CANS
FUEL SLUGS
See FUEL RODS
FUEL SLURRIES
Additives
Improving the stability of coal slurries. Quarterly and half-yearly report, September 15-December 15, 1985 and September 15, 1985-March 15, 1986, 11:29206 (R;US)
Chemical Composition
Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)
Combustion
Air blast type coal slurry fuel injector, 11:29224 (P;US)
On-Line Measurement Systems
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Research Programs
Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)
Rheology
Polydisperse coal slurry rheology. Quarterly report, 11:29179 (R;US)
Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)
Sedimentation
Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)
Stability
Improving the stability of coal slurries. Quarterly and half-yearly report, September 15-December 15, 1985 and September 15, 1985-March 15, 1986, 11:29206 (R;US)
Viscosity
Polydisperse coal slurry rheology. Quarterly report, 11:29179 (R;US)
Yield Strength
Sedimentation of CWM and sediment characterization. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29180 (R;US)
FUEL SUPPLIES
Mathematical Models
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
FUEL SUSPENSIONS
See FUEL SLURRIES
FUELS
See also AUTOMOTIVE FUELS
AVIATION FUELS
FUEL SLURRIES
NUCLEAR FUELS
SOLVENT-REFINED COAL
SYNTHETIC FUELS
WOOD FUELS
Combustion Properties
Controlling compatibility of residual fuel oils, 11:29239 (RA;US)
Cost
Gasification of sod peat in a fixed bed cocurrent gasifier, 11:29169 (R;SE)

Heating
Gasification of sod peat in a fixed bed cocurrent gasifier, 11:29169 (R;SE)
FUELS (NUCLEAR)
See NUCLEAR FUELS
FUELWOOD
See WOOD FUELS
FUJAIRA
See UNITED ARAB EMIRATES
FUMES
See AEROSOLS
FURANS
See also BENZOFURANS
TETRAHYDROFURAN
Dimerization
I. Kinetic and mechanistic study of the [4+4] dimerization of 2,3-dimethylene-2,3-dihydrofuran. II. Preparation of 2,3-dimethylene-2,3-dihydrobenzo[B]furan by the flash vacuum pyrolysis of 2-methyl-3-benzo[B]furylmethyl benzoate. III. Reaction of 2,3-dimethylene-2,3-dihydrofuran with triplet oxygen, 11:30270 (D;US)
FUSED SALTS
See MOLTEN SALTS
FUSION ELECTROMAGNETIC INDUCTION EXPERIME
See FELIX FACILITY
FUSION ENERGY
See THERMONUCLEAR REACTORS
FUSION (NUCLEAR)
See THERMONUCLEAR REACTIONS
FUSION REACTIONS
See HEAVY ION FUSION REACTIONS
FUSION REACTORS
See THERMONUCLEAR REACTORS
FUSION (WELDING)
See WELDING

G

G CODES
Automated sensitivity analysis using the GRESS language, 11:30741 (R;US)
GADOLINIUM 153
Electron Capture Decay
On the electron capture decay energies of ^{153}Gd and ^{178}Hf, 11:30917 (R;AU)
Ion Exchange
Use of high-pressure ion exchange for the production of gadolinium-153. Status report, 11:30314 (R;US)
Production
Use of high-pressure ion exchange for the production of gadolinium-153. Status report, 11:30314 (R;US)
GAGES (STRAIN)
See STRAIN GAGES
GALACTIC EVOLUTION
Infrared search for primeval galaxies, 11:30801 (RA;GB)
Cosmological Models
Galaxy formation theory and large scale structure in the universe, 11:30775 (RA;JP)
Scenarios of galaxy formation, 11:30774 (RA;JP)
GALAXIES
See also MILKY WAY
SEYFERT GALAXIES
Age Estimation
Near infrared study of Virgo dwarf ellipticals, 11:30795 (RA;GB)
Color
Infrared photometric properties of the average galaxy, 11:30794 (RA;GB)
Information Systems
Infrared maps of M81: an example of the IRAS Close Galaxy Programme, 11:30798 (RA;GB)
Infrared Spectra
Cosmological results from IRAS, 11:30804 (RA;GB)
Extragalactic Infrared Astronomy, 11:30790 (R;GB)
Infrared emission and extragalactic starbursts, 11:30797 (RA;GB)
Infrared maps of M81: an example of the IRAS Close Galaxy Programme, 11:30798 (RA;GB)
Infrared photometric properties of the average galaxy, 11:30794 (RA;GB)
Infrared search for primeval galaxies, 11:30801 (RA;GB)
Near infrared imaging of galaxies, 11:30793 (RA;GB)
Near infrared study of Virgo dwarf ellipticals, 11:30795 (RA;GB)
Starbursts in non-interacting galaxies, 11:30792 (RA;GB)
Luminosity
Infrared photometric properties of the average galaxy, 11:30794 (RA;GB)
Infrared search for primeval galaxies, 11:30801 (RA;GB)
Nonluminous Matter
Probing the structure of the galactic halo with gamma rays produced by WIMP annihilations, 11:30764 (R;US)
Star Evolution
Infrared emission and extragalactic starbursts, 11:30797 (RA;GB)
Starbursts in non-interacting galaxies, 11:30792 (RA;GB)
GALAXY CLUSTERS
Infrared Spectra
Near infrared study of Virgo dwarf ellipticals, 11:30795 (RA;GB)
Sunyaev-Zeldovich effect at 1.15 mm wavelength, 11:30802 (RA;GB)
GALAXY NUCLEI
Central part of galaxies.
Infrared Spectra
Infrared emission from active nuclei, 11:30799 (RA;GB)
GALLIUM ARSENIDE SOLAR CELLS
Chemical Vapor Deposition
Experience with OMCVD production of GaAs solar cells, 11:29528 (RA;US)
Crystal Defects
Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells, 11:29525 (RA;US)
Crystal Growth
Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells, 11:29525 (RA;US)
Design
N/P GaAs concentrator solar cells with an improved grid and bushbar contact design, 11:29520 (RA;US)
Efficiency
Evaluation of AlsubxGasub1-xsubAs solar cells, 11:29522 (RA;US)
GaAsP on GaP top solar cells, 11:29523 (RA;US)
Gallium arsenide solar cell efficiency: problems and potential, 11:29519 (RA;US)
High-efficiency AlGaAs-GaAs Cassegrainian concentrator cells, 11:29521 (RA;US)
N/P GaAs concentrator solar cells with an improved grid and bushbar contact design, 11:29520 (RA;US)
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)
Possible radiation-resistant solar cell geometry using superlattices, 11:29527 (RA;US)
Fabrication
Evaluation of AlsubxGasub1-xsubAs solar cells, 11:29522 (RA;US)
Photovoltaic concentrator research status, 11:29611 (BA;US)
Status of photovoltaics R & D at SERI, 11:29548 (BA;US)
Oxidation
GaAsP on GaP top solar cells, 11:29523 (RA;US)
Performance
Two years of on-orbit gallium arsenide performance from the LIPS solar cell panel experiment, 11:29537 (RA;US)
Performance Testing
Mechanically-stacked multijunction solar cells, 11:29555 (BA;US)
Physical Radiation Effects
Depletion layer recombination effects on the radiation damage hardness of gallium arsenide cells, 11:29535 (RA;US)

DLTS analysis of radiation-induced defects in one-MeV electron irradiated germanium and Alsub0.17Gasub0.83As solar cells, 11:29534 (RA;US)
Performance of Hughes GaAs concentrator cells under 1-MeV electron irradiation, 11:29536 (RA;US)
Space Environment Workshop, 11:29544 (RA;US)
Testing of gallium arsenide solar cells on the CRRES vehicle, 11:29539 (RA;US)
Radiosensitivity
N/P GaAs concentrator solar cells with an improved grid and bushbar contact design, 11:29520 (RA;US)
Possible radiation-resistant solar cell geometry using superlattices, 11:29527 (RA;US)
Recombination
Depletion layer recombination effects on the radiation damage hardness of gallium arsenide cells, 11:29535 (RA;US)
Reflectivity
Optical effects of thin film adhesives in multijunction solar cells, 11:29549 (BA;US)
Research Programs
Cell research and technology workshop, 11:29543 (RA;US)
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)
Specifications
Testing of gallium arsenide solar cells on the CRRES vehicle, 11:29539 (RA;US)
Superlattices
Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells, 11:29525 (RA;US)
Possible radiation-resistant solar cell geometry using superlattices, 11:29527 (RA;US)
Temperature Effects
Thermal stress cycling of GaAs solar cells, 11:29540 (RA;US)
Thermal Cycling
Thermal stress cycling of GaAs solar cells, 11:29540 (RA;US)
Thermal Degradation
Testing of gallium arsenide solar cells on the CRRES vehicle, 11:29539 (RA;US)

GALLIUM ARSENIDES
Carrier Lifetime
Comparison of Auger recombination in GaInAs-AlInAs multiple quantum well structure and in bulk GaInAs, 11:30156 (RA;AT)
Chemical Vapor Deposition
Vacuum MOCVD fabrication of high efficience cells, 11:29524 (RA;US)
Chlorination
Thermal and ion-assisted reactions of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine, 11:30161 (R;US)
Crystal Defects
EL2 and related defects in GaAs - challenges and pitfalls, 11:29553 (BA;US)
Dislocations
Dislocation reduction in epitaxial GaAs on Si (100), 11:30165 (J;US)
Efficiency
Vacuum MOCVD fabrication of high efficience cells, 11:29524 (RA;US)
Electronic Structure
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Energy Gap
EL2 and related defects in GaAs - challenges and pitfalls, 11:29553 (BA;US)
Impurities
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Photoconductivity
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Scattering
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Superlattices
Dislocation reduction in epitaxial GaAs on Si (100), 11:30165 (J;US)

GALLIUM PHOSPHIDE SOLAR CELLS
Crystal Defects
Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells, 11:29525 (RA;US)
Crystal Growth
Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells, 11:29525 (RA;US)
Efficiency
GaAsP on GaP top solar cells, 11:29523 (RA;US)
Fabrication
Status of photovoltaics R & D at SERI, 11:29548 (BA;US)
Oxidation
GaAsP on GaP top solar cells, 11:29523 (RA;US)
Superlattices
Control of superlattice morphology in GaAs sub1-subxPsubx cascade cells, 11:29525 (RA;US)

GALLIUM PHOSPHIDES
Electronic Structure
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Impurities
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Photoconductivity
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)
Scattering
Neutral impurity scattering in AlGaAs, 11:30166 (J;US)

GAMMA DETECTION
High range gamma radiation meter, 11:30434 (J;US)
Data Acquisition Systems
A sophisticated gamma-ray data acquisition system based on an IBM PC/XT computer, 11:30437 (J;US)
Semiconductor Detectors
A solid state directional gamma detector, 11:30433 (J;US)

GAMMA DOSIMETRY
Proportional Counters
A new type of REM measuring instrument, 11:30440 (J;US)
Tissue-Equivalent Detectors
A new type of REM measuring instrument, 11:30440 (J;US)

GAS BEARINGS
Mechanical Vibrations
Vibration damping in externally pressurized gas bearings, 11:30353 (R;US)

GAS COOLANTS
See GASES

GAS ENGINES
See INTERNAL COMBUSTION ENGINES

GAS FLOW
See also SLIP FLOW
Flowmeters
Problems of large-volume gas flow measurements in the high and low pressure range. Proceedings, 11:29253 (R;DE;In German)

GAS LASERS
See also METAL VAPOR LASERS
Design
Inductive gas line for pulsed lasers, 11:30368 (P;US)
Electric Coils
Inductive gas line for pulsed lasers, 11:30368 (P;US)
Gas Flow
Inductive gas line for pulsed lasers, 11:30368 (P;US)

GAS TURBINE POWER PLANTS
Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)
Operating Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)

GAS TURBINES
See also COAL-FIRED GAS TURBINES
Cogeneration
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)
Combustors
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)

Comparative Evaluations
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)
Computerized Simulation
Numerical flow analysis for axial flow turbine, 11:30036 (RA;JP)
Economic Analysis
Generic studies of advanced fluid bed air heater technology. Topical report Number 6. Costs and economic analyses of the generic fluid bed air heater systems (Including topping combustion, pressurizing, etc.), 11:29216 (R;US)
Fluid Flow
Numerical flow analysis for axial flow turbine, 11:30036 (RA;JP)
GASEOUS EFFLUENTS
See GASEOUS WASTES
GASEOUS WASTES
See also EXHAUST GASES
FLUE GAS
Desulfurization
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)
Ecological Concentration
Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
Fluorescence Spectroscopy
Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
NMR Spectra
Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
Quantitative Chemical Analysis
Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
Scrubbing
Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort, 11:29281 (BA;US)
Sulfur Content
Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
GASES
See also AIR
COMPRESSED GASES
COVER GAS
EXHAUST GASES
FUEL GAS
SHALE GAS
VAPORS
Separation Processes
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
GASOLINE ENGINES
See INTERNAL COMBUSTION ENGINES
GENE LOCI
See GENES
GENERATORS (PULSE)
See PULSE GENERATORS
GENERATORS (STEAM)
See STEAM GENERATORS
GENES
DNA Sequencing
Nuclear and organelle split genes, 11:30648 (BA;IN)
GENETIC RADIATION EFFECTS
Mathematical Models
Genetic effects, 11:29449 (RA;US)
GEOPRESSURED SYSTEMS
Geothermal Wells
Sweet Lake geopressured-geothermal project, Magma Gulf-Technadril/DOE Amoco fee. Volume III. Final report. Annual report, February 1982-March 1985, 11:29638 (R;US)
Research Programs
Overview geopressure program, 11:29914 (RA;US)
Overview of geopressured-geothermal research, 11:29915 (RA;US)
Scale Control
Scale control in geopressured energy production, 11:29636 (RA;US)
GEOTHERMAL ENERGY
Research Programs
Geosciences research in DOE - 1985, 11:29909 (RA;US)
Magma energy and geothermal permeability enhancement programs, 11:29641 (RA;US)
Overview of the US Department of Energy Geothermal program, 11:29908 (RA;US)
Overview on Cascades drilling status, 11:29619 (RA;US)
Overview of geopressured-geothermal research, 11:29915 (RA;US)
Salton Sea scientific drilling program: drilling program status, 11:29618 (RA;US)
Sandia geothermal technology program: interactions with other DOE research and CSDP, 11:29910 (RA;US)
Resource Development
Geothermal activities in Central America, 11:29981 (RA;US)
Technology Transfer
Federal geothermal technology transfer activities, 11:29626 (RA;US)
Technology transfer on the heber geothermal binary demonstration power plant project, 11:29625 (RA;US)
Tracer Techniques
Development and application of tracers: examples of field and experimental studies, 11:29620 (RA;US)
GEOTHERMAL FLUIDS
Heat Transfer
Convective heat flow probe, 11:29624 (P;US)
GEOTHERMAL INDUSTRY
Economic Analysis
Status of US geothermal industry, 11:29613 (RA;US)
Socio-Economic Factors
Status of US geothermal industry, 11:29613 (RA;US)
GEOTHERMAL POWER PLANTS
Demonstration Plants
Heber binary project, 11:29627 (RA;US)
Design
Heber binary project, 11:29627 (RA;US)
GEOTHERMAL RESOURCES
Ground Water
Summary of the geothermal prospects for the United Kingdom. Final report of the British Geological Survey's Geomthermal Energy Programme 1979-1984, 11:29616 (R;GB)
Hot-Dry-Rock Systems
Summary of the geothermal prospects for the United Kingdom. Final report of the British Geological Survey's Geomthermal Energy Programme 1979-1984, 11:29616 (R;GB)
Research Programs
Geothermal reservoir technology, 11:29614 (RA;US)
GEOTHERMAL WELLS
Research Programs
Open hole packer and running procedure for Hot Dry Rock reservoir testing, 11:29633 (RA;US)
Temperature Logging
Convective heat flow probe, 11:29624 (P;US)
Testing
Sweet Lake geopressured-geothermal project, Magma Gulf-Technadril/DOE Amoco fee. Volume III. Final report. Annual report, February 1982-March 1985, 11:29638 (R;US)
Well Logging Equipment
Use of an acoustic borehole televiewer to investigate casing corrosion in geothermal wells, 11:29623 (R;US)
GERMAN FEDERAL REPUBLIC
See FEDERAL REPUBLIC OF GERMANY
GERMANIUM
Physical Radiation Effects
DLTS analysis of radiation-induced defects in one-MeV electron irradiated germanium and Alsub0.17Gasub0.83As solar cells, 11:29534 (RA;US)

GERMANIUM 76 TARGET
Krypton 86 Reactions
Study of transitional Erbium nuclei (N=86) at very high spin. Highlight of dipolar transitions and medium lifetimes in the continuum, 11:30909 (R;FR;In French)
GERMANIUM ALLOYS
Formation Free Enthalpy
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
Lattice Parameters
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
Order Parameters
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
Stability
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
GERMANY (FEDERAL REPUBLIC)
See FEDERAL REPUBLIC OF GERMANY
GIANT RESONANCE
Spin Flip
Can we learn about the spin flip giant dipole resonances with pions?, 11:30940 (BA;US)
GIBBSITE
Precipitation
Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation, 11:29277 (BA;US)
GLASS
See also BOROSILICATE GLASS
Absorption Spectroscopy
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Chemical Composition
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Chemical Preparation
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Crack Propagation
Microscopic image analysis of slow crack growth in vitreous materials, 11:30388 (R;US)
Fabrication
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Gravimetric Analysis
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
Leaching
Leach testing of waste glasses under near-saturation conditions, 11:29429 (J;US)
Solution chemistry of silicate and borate materials, 11:30163 (R;US)
Microwave Heating
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
Optical Properties
A cerium glass fiber-optic active target for high energy physics experiments, 11:30474 (J;US)
Properties of new scintillation glasses and scintillating fibers, 11:30473 (J;US)
Thermal Diffusion
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
Thermal Expansion
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
Thermodynamic Properties
Pressurized heat treatment of glass-ceramic to control thermal expansion, 11:30127 (P;US)
X-Ray Fluorescence Analysis
Analysis of S-glass ceramic lot No. 84-132 for use as a standard reference material, 11:30164 (R;US)
GLASS MELTERS
See CERAMIC MELTERS
GLAUBER'S SALT
See SODIUM SULFATES
GLOVEBOXES
Glove box operations for transplutonium element production, 11:30336 (R;US)
Surface Contamination
Surface tritium contamination studies, 11:29437 (RA;US)
GLUEBALLS
Particle Production
Gluonium candidates from hadronic and e^+e^- interactions, 11:30845 (R;US)
GLUONIUM
See GLUEBALLS
GLUTAMIC ACID
Chemical Preparation
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
GLUTATHIONE
Uptake
Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
GLYCOLIPIDS
Biosynthesis
Microbial biosurfactant - physiology, biochemistry, and applications, 11:29247 (J;US)
Chemical Composition
Microbial biosurfactant - physiology, biochemistry, and applications, 11:29247 (J;US)
GLYCOLS
See also PINACOL
POLYETHYLENE GLYCOLS
Membrane Transport
Abscisic acid accumulation in spinach leaf slices in the presence of penetrating and nonpenetrating solutes, 11:30682 (J;US)
GNEISSES
Geologic Fractures
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
Lithology
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
GOBAR GAS
See METHANE
GOLD COMPOUNDS
Crystal Structure
Structure of trichloro(diethylenetriamine)gold(II), Au(dien)Cl_3, determined by single-crystal x-ray diffraction, Raman, and EXAFS spectroscopies: an EXAFS caveat, 11:30254 (J;US)
GRAMINEAE
See GRASS
GRAND UNIFIED THEORY
Baryon Number
Proton decay: theory versus experiment, 11:30877 (R;AT)
Chiral Symmetry
Mass hierarchies of quarks and leptons in a supersymmetric SP(2N) subcolor theory, 11:30864 (R;JP)
Renormalization
Grand unification mass scale and proton life time in SO(10) model, 11:30883 (RA;JP)
SO-10 Groups
Grand unification mass scale and proton life time in SO(10) model, 11:30883 (RA;JP)
Proton decay in grand unified theories, 11:30868 (RA;JP)
SU-5 Groups
Proton decay in grand unified theories, 11:30868 (RA;JP)
Supersymmetry
Mass of superpartners in SGUT, 11:30884 (RA;JP)
GRANITES
See also APLITES
GRANODIORITES

PEGMATITES
Deformation
Inelastic deformations of fault and shear zones in granitic rock, 11:30757 (R;US)
Elasticity
Spent Fuel Test-Climax mineby revisited, 11:29418 (R;US)
Geologic Fractures
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
Lithology
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
Mineralogy
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
Petrogenesis
Thermally induced chemical migration: a natural analog approach. [Technical progress report], 11:30759 (R;US)
Rock Mechanics
Inelastic deformations of fault and shear zones in granitic rock, 11:30757 (R;US)
Thermomechanical modeling of the Spent Fuel Test-Climax (NNWSI project), 11:30756 (R;US)
Stresses
Spent Fuel Test-Climax mineby revisited, 11:29418 (R;US)
Thermomechanical modeling of the Spent Fuel Test-Climax (NNWSI project), 11:30756 (R;US)
Temperature Effects
Thermomechanical modeling of the Spent Fuel Test-Climax (NNWSI project), 11:30756 (R;US)
Tunneling
Spent Fuel Test-Climax mineby revisited, 11:29418 (R;US)
GRANODIORITES
Geologic Fractures
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
Lithology
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
GRANULAR BED FILTERS
Performance Testing
Evaluation and development of candidate high temperature filter devices for pressurized fluidized bed combustion, 11:29687 (RA;US)
GRANULAR MATERIALS
For unspecified materials having a granular texture.
Flow Models
Model for the flow of particulate matter with application to chutes. Quarterly technical report, December 1, 1985-February 28, 1986, 11:29205 (R;US)
GRAPHITE
Mechanical Properties
Investigation of the strength of H440 graphite when subjected to combined primary and secondary stress, 11:30162 (R;US)
GRAPHITE FIBERS
See CARBON FIBERS
GRAPHITE MODERATOR
See GRAPHITE
GRASS
Contamination
Behavior of ^{137}Cs-tagged particles in a fescue meadow, 11:30701 (BA;XA)
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)
Radionuclide Kinetics
Behavior of ^{137}Cs-tagged particles in a fescue meadow, 11:30701 (BA;XA)
GRAVITATION
Symmetry Breaking
Universe created from 'nothing' as a broken symmetry theory of gravity, 11:30769 (R;XA)
GREAT BRITAIN
See UNITED KINGDOM
GREAT LAKES REGION
See FEDERAL REGION V
GREAT PLAINS
Air Quality
A case study of the effects of local and distant sources of alkaline material on precipitation in the midwest and plains, 11:30550 (J;US)
GREEN OIL
See SHALE OIL FRACTIONS
GREEN RIVER FORMATION
See also MAHOGANY ZONE
UINTA FORMATION
Geochemical Surveys
Fluorine in Colorado oil shale, 11:29276 (BA;US)
Oil Shale Deposits
Fluorine in Colorado oil shale, 11:29276 (BA;US)
Initial results of Green River Oil Shale Processing using the University of Utah's pilot scale bottom burning retort, 11:29269 (BA;US)
GROUND DISPOSAL
Design
Subsurface moisture regimes and tracer movement under two types of trench-cap designs for shallow land burial sites, 11:29403 (R;US)
Technology development for the design of waste repositories at arid sites: field studies of biointrusion and capillary barriers, 11:29404 (R;US)
GROUND SOURCE HEAT PUMPS
Field Tests
Residential earth-coupled heat pump demonstration. Final report, 11:30014 (R;US)
Performance
Residential earth-coupled heat pump demonstration. Final report, 11:30014 (R;US)
GROUND WATER
Chemical Composition
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
Monitoring
Underground coal gasification: environmental update, 11:29171 (B;US)
Radiation Monitoring
Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
Radioactivity
Characterization and anion exchange removal of uranium from Hanford ground water, 11:30616 (R;US)
Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
Radionuclide Migration
Distribution of plutonium and americium beneath a 33-year-old liquid waste disposal site, 11:30618 (J;US)
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)
Rock-Fluid Interactions
Permeability and pore-fluid chemistry of the Bullfrog Tuff in a temperature gradient: summary of results, 11:30761 (R;US)
Sampling
Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
GROUND-WATER RESERVES
See AQUIFERS
GROUTING
Chemical Composition
Operational and long-term performance assessment for Hanford grout, 11:29379 (RA;US)
Performance Testing
Operational and long-term performance assessment for Hanford grout, 11:29379 (RA;US)
GUANIDYLAMINOVALERIC ACID
See ARGININE
GUATEMALA
Resource Development
Geothermal activities in Central America, 11:29981 (RA;US)

GULF COAST
Climates
Energy conservation and its implication for architectural design and town planning in the hot-arid areas of Saudi Arabia and the US Gulf States, 11:29589 (RA;US)

H

H2 REGIONS
Far Infrared Radiation
Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions, 11:30784 (R;US)
Maps
Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions, 11:30784 (R;US)
Radiowave Radiation
Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions, 11:30784 (R;US)
HABITAT
Mitigation
Ural-Tweed bighorn sheep - wildlife mitigation project. Annual report, 1 September 1984-31 December 1985, 11:30590 (R;US)
Remote Sensing
Feasibility study of wood stork foraging habitat mapping using landsat multispectral data, 11:30595 (R;US)
HADRON REACTIONS
Historical Aspects
Reflection of the classical age in the intermediate energy physics, 11:30934 (R;JP)
HADRONS
Particle Structure
On the hadron as a microuniverse, 11:30862 (R;XA)
HAFNATES
Specific compounds should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
HAFNIUM 175
Electron Capture Decay
On the electron capture decay energies of ^{153}Gd and ^{175}Hf, 11:30917 (R;AU)
HAFNIUM 178
Radioisotope Generators
Development of tungsten-tantalum generator. Final report, 11:30310 (R;US)
HALL GENERATORS
See MHD GENERATORS
HANDLING (WASTES)
See WASTE MANAGEMENT
HANFORD RESERVATION
Basalt
State of in situ stresses determined by hydraulic fracturing at the Hanford Site, 11:29415 (R;US)
High-Level Radioactive Wastes
Slurry growth: the characterization of a unique phenomenon at the Hanford Site, 11:29394 (RA;US)
Hydrology
Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
Mountains
Structure and evolution of the Horse Heaven Hills in South-Central Washington, 11:29414 (R;US)
Radioactive Waste Management
Waste management practices to control biological transport of radioactivity at the Hanford Site, 11:29434 (RA;US)
Radioactivity
Characterization and anion exchange removal of uranium from Hanford ground water, 11:30616 (R;US)
Water Quality
Results of the separations area ground-water monitoring network for 1984, 11:30617 (R;US)
Water Tables
Hanford site water table changes 1950-1980: data observations and evaluation, 11:30604 (R;US)
HARD COAL
See BLACK COAL
HARTREE-FOCK-BOGOLYUBOV THEORY
Wave Functions
Microscopic study of the S band in the generator co-ordinate approach, 11:30918 (R;XA)
HARVESTING EQUIPMENT
Cost
Utilization of chipwood in Lapland. Prehandling, 11:29491 (R;FI;In Finnish)
HASTELLOY C-276
See HASTELLOYS
HASTELLOY C-4
See HASTELLOYS
HASTELLOYS
Corrosion Resistance
Corrosion behaviour of container materials for geological disposal of high level radioactive waste, 11:30092 (R;FR)
HAWAII
Geothermal Wells
Geothermal research at the Puna Facility. Technical report, 11:29642 (R;US)
HAZARDOUS MATERIALS
Not for radioactive materials.
Accidents
Improvements in release probability by using an overpack (Obsolete munitions), 11:29298 (R;US)
Environmental Impacts
Use of aquatic microcosms for hazard identification, 11:30611 (RA;US)
Materials Handling
DOE approach to threshold quantities, 11:29332 (RA;US)
Packaging
Improvements in release probability by using an overpack (Obsolete munitions), 11:29298 (R;US)
Rail Transport
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Remedial Action
Hazardous Waste Remedial Actions Program: integrating waste management, 11:29445 (R;US)
Road Transport
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Waste Disposal
Hazardous waste. Federal agency hazardous waste disposal at Kettlemen Hills, California, 11:29936 (R;US)
Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual (Mixed radioactive and hazardous wastes), 11:29450 (R;US)
Regulatory framework for hazardous mixed wastes, 11:29328 (RA;US)
Waste Management
DOE hazardous waste management program, 11:29330 (RA;US)
Framework for resolving hazardous waste cleanup liability, 11:30593 (RA;US)
Management of active and abandoned hazardous sites under federal statutes, 11:29331 (RA;US)
Strategy and need: DOE's hazardous waste program, 11:29333 (RA;US)
HD 8077
See NICKEL BASE ALLOYS
HDO
See DEUTERIUM COMPOUNDS
HEAT DISSIPATION
See DIFFUSION
ENVIRONMENTAL TRANSPORT
HEAT TRANSFER
HEAT ENGINES
See also INTERNAL COMBUSTION ENGINES
STIRLING ENGINES

Brayton Cycle
Operating efficiencies of a Lysholm helical expander for Brayton-cycle heat engines, 11:30407 (R;US)
Efficiency
Operating efficiencies of a Lysholm helical expander for Brayton-cycle heat engines, 11:30407 (R;US)
HEAT EXCHANGERS
See also RADIATORS
Ceramics
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Design
Heat cycle research experimental program, FY-1985, 11:29913 (RA;US)
Fluid Flow
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume II. User's manual, 11:29801 (R;US)
Heat Transfer
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume II. User's manual, 11:29801 (R;US)
Materials Testing
Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)
Performance Testing
Heat cycle research experimental program, FY-1985, 11:29913 (RA;US)
HEAT PIPES
Mathematical Models
Heat pipe effects in nuclear waste isolation: a review, 11:29405 (R;US)
HEAT PUMPS
See also GROUND SOURCE HEAT PUMPS
WATER SOURCE HEAT PUMPS
Cost Benefit Analysis
Assessment of the cost-effectiveness and potential of heat pumps for domestic hot water heating, 11:29993 (R;GB)
Hot Water
Assessment of the cost-effectiveness and potential of heat pumps for domestic hot water heating, 11:29993 (R;GB)
Operation
Vapour recompression evaporation of black liqour, 11:30026 (R;FI;In Finnish)
Refrigerants
Secondary refrigerants for heat pump applications. Studies of thermodynamic properties and corrosion, 11:29990 (R;SE;In Swedish)
Waste Heat Utilization
Heat pumps for district heating of smaller cities, 11:30024 (R;FI;In Finnish)
HEAT RECOVERY EQUIPMENT
Design
Director fired absorption machine flue gas recuperator, 11:30030 (P;US)
Materials Testing
Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)
Performance
Experiment to determine properties of packed particle beds and regenerators at cryogenic temperatures, 11:30360 (J;US)
HEAT RESISTING ALLOYS
See also HASTELLOYS
STAINLESS STEEL-304
STAINLESS STEEL-304L
STAINLESS STEEL-310
STAINLESS STEEL-316
Heat Treatments
Maraging superalloys and heat treatment processes, 11:30107 (P;US)
Microstructure
Maraging superalloys and heat treatment processes, 11:30107 (P;US)
HEAT TRANSFER
See also CONVECTION
Computerized Simulation
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume I. Equations and numerics, 11:29800 (R;US)
HEAT TRANSFER PROPERTIES
See THERMODYNAMIC PROPERTIES
HEAT TRANSMISSION
See HEAT TRANSFER
HEATERS
See also AIR HEATERS
Design
Combustion heater for oil shale, 11:29265 (P;US)
HEATING SYSTEMS
See also SOLAR HEATING SYSTEMS
Baking
TFTR bakeout system, 11:31209 (J;US)
Computerized Control Systems
Microprocessor controller for mold heating and cooling. Final report, 11:30391 (R;US)
Control Equipment
Heat metering for domestic premises, 11:29994 (R;GB)
Environmental Effects
Ecological benefits of natural gas. A choice of illustrative papers, 11:30542 (R;DE;In German)
Temperature Control
TFTR bakeout system, 11:31209 (J;US)
Temperature Monitoring
Heat metering for domestic premises, 11:29994 (R;GB)
TFTR bakeout system, 11:31209 (J;US)
HEAVY ION ACCELERATORS
Includes combined accelerator types for heavy ion acceleration.
See also HHIRF ACCELERATOR
Cost
Comparison of the design and costs of induction linac drivers for inertial fusion using ions of differing mass, 11:30409 (R;US)
Feasibility Studies
Comparison of the design and costs of induction linac drivers for inertial fusion using ions of differing mass, 11:30409 (R;US)
HEAVY ION FUSION REACTIONS
Lectures
Heavy ion induced fusion/fission and barrier penetration. Lecture notes, 11:30929 (R;AU)
HEAVY IONS
Whenever possible use one of the more specific terms listed under ION BEAMS.
Radiobiology
Radiobiological studies on eggs of the rice weevil (Tribolium confusum) after exposure to heavy primary particles of the cosmic radiation, 11:30693 (R;DE;In German)
HEAVY LEPTONS
Particle Production
New particle searches at e^+e machines, 11:30838 (R;FR)
HEAVY OILS
See PETROLEUM
HECTOR REACTOR
HECTOR measurements on plutonium-uranium metal fuel, 11:29815 (R;GB)
Reactivity change measurements on plutonium uranium oxide fuel clusters in a plutonium uranium metal lattice in HECTOR, 11:29814 (R;GB)
HELA CELLS
Genetic Radiation Effects
Inhibition by hyperthermia of repair synthesis and chromatin reassembly of ultraviolet-induced damage to DNA, 11:30700 (J;US)
HELIOSTATS
Orientation
Evaluation of heliostat field/receiver configurations, 11:29609 (R;US)
Performance Testing
Evaluation of heliostat field/receiver configurations, 11:29609 (R;US)

HELIUM
Anions
Production and destruction of metastable negative ions. Progress report, September 1, 1985-August 31, 1986, 11:30813 (R;US)
Leaks
Liquid to gas leak ratios with liquid nitrogen and liquid helium, 11:31190 (J;US)
HELIUM 3
Nuclear Radii
Experiments using beams of unstable nuclear isotopes. Interaction cross sections and the radii of He isotopes, 11:30894 (R;JP)
Measurements of interaction cross sections and radii of He isotopes, 11:30895 (R;JP)
HELIUM 3 REACTIONS
Pickup Reactions
Gamma-decay of the 1gsub(9/2) and 2p inner-hole states in ^{111}Sn via the ^{113}Sn(^{3}He) reaction at 32 MeV, 11:30911 (R;FR)
HELIUM 3 TARGET
Photonuclear Reactions
Pion photoproduction in nuclei, 11:30892 (R;FR)
HELIUM 4
See also HELIUM II
Nuclear Radii
Experiments using beams of unstable nuclear isotopes. Interaction cross sections and the radii of He isotopes, 11:30894 (R;JP)
Measurements of interaction cross sections and radii of He isotopes, 11:30895 (R;JP)
HELIUM 4 REACTIONS
See ALPHA REACTIONS
HELIUM 4 TARGET
Photonuclear Reactions
Pion photoproduction in nuclei, 11:30892 (R;FR)
HELIUM 6
Nuclear Radii
Experiments using beams of unstable nuclear isotopes. Interaction cross sections and the radii of He isotopes, 11:30894 (R;JP)
Measurements of interaction cross sections and radii of He isotopes, 11:30895 (R;JP)
HELIUM 8
Nuclear Radii
Experiments using beams of unstable nuclear isotopes. Interaction cross sections and the radii of He isotopes, 11:30894 (R;JP)
Measurements of interaction cross sections and radii of He isotopes, 11:30895 (R;JP)
HELIUM DILUTION REFRIGERATORS
Design
combined cold compressor ejector helium refrigerator, 11:30017 (P;US)
HELIUM II
The phase of liquid helium-4 which is stable at temperatures between absolute zero and the lambda point (about 2.2 K).
Energy Gap
Roton-like excitation in superfluid helium-4, 11:30820 (R;XA)
Excitation
Roton-like excitation in superfluid helium-4, 11:30820 (R;XA)
HELIUM METHOD
See ISOTOPE DATING
HEMIC DISEASES
Pathogenesis
Myeloproliferative disease in a cat, 11:30673 (J;US)
HEMOGLOBIN
Electronic Structure
Optical spectroscopic studies of heme proteins at high pressure, 11:30253 (J;US)
HETEROCYCLIC COMPOUNDS
See also FURANS
Chemical Preparation
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Chemical Reactions
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Crystal Structure
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Energy Transfer
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Excited States
Role of geometric distortion in the quenching behaviors of all-trans 1,4-diphenyl-1,3-butadiene triplet, 11:30279 (J;CH)
Fluorescence
Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies, 11:30276 (J;US)
Isomerization
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Molecular Structure
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Oxidation
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Photochemistry
Role of geometric distortion in the quenching behaviors of all-trans 1,4-diphenyl-1,3-butadiene triplet, 11:30279 (J;CH)
Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies, 11:30276 (J;US)
Photolysis
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Rotation
Rotamerism in (2-anthryl)ethylenes. Evidence from fluorescence lifetimes and quenching studies, 11:30276 (J;US)
HETEROJUNCTIONS
Prior to July 1981, this concept was indexed to SEMICONDUCTOR JUNCTIONS.
Etching
Thermal and ion-assisted reactions of Al/sub 0.3/Ga/sub 0.7/As with molecular chlorine, 11:30161 (R;US)
HEXADECANOIC ACID
Biochemistry
Analysis of photosynthetic antenna function in a mutant of Arabidopsis thaliana (L.) lacking trans-hexadecenoic acid, 11:30630 (J;US)
HEXENES
Configuration
Conformational analysis of 1,4-cyclohexadienes. A shallow boat-shaped 1,4-dihydronaphthalene, 11:30261 (J;US)
Conformational Changes
Conformational analysis of 1,4-cyclohexadienes. A shallow boat-shaped 1,4-dihydronaphthalene, 11:30261 (J;US)
HFR REACTOR
Reactor Vessels
High flux testing reactor Petten. Replacement of the reactor vessel and connected components. Overall report, 11:29820 (R;FR)
Repair
High flux testing reactor Petten. Replacement of the reactor vessel and connected components. Overall report, 11:29820 (R;FR)
HHIRF
See HHIRF ACCELERATOR
HHIRF ACCELERATOR
Modifications
Future directions in intermediate energy heavy ion physics. A proposed expansion of the Holifield Facility, 11:30411 (R;US)

HIGGS BOSONS
Particle Identification
How to search for new particles at anti pp colliders, 11:30847 (BA;US)
Particle Production
New particle searches at e^+e machines, 11:30838 (R;FR)
HIGH ALTITUDE (STRATOSPHERE)
See STRATOSPHERE
HIGH BTU GAS
Over 900 Btu/ft³.
Calorific Value
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Chemical Composition
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Density
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Production
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Great Plains Coal Gasification Plant start-up and modification report, 11:29154 (R;US)
HIGH ENERGY PHYSICS
Use only for articles of a very broad nature such as an annual research program, etc.
Forecasting
Physics with high energy accelerators in the future, 11:30830 (RA;JP)
HIGH ENERGY RADIOTHERAPY
See RADIOTHERAPY
HIGH EXPLOSIVES
See CHEMICAL EXPLOSIVES
HIGH FLUX REACTOR PETTEN
See HFR REACTOR
HIGH-FREQUENCY HEATING
See also ECR HEATING
ICR HEATING
LOWER HYBRID HEATING
Complex geometric optics theory in an inhomogeneous plasma. Appendix B, 11:30962 (R;US)
Mathematical Models
Theoretical studies of the heating of toroidal plasmas with radiofrequency electromagnetic radiation. Progress report, July 1, 1985-June 30, 1986, 11:30965 (R;US)
HIGH-LEVEL RADIOACTIVE WASTES
Containers
Corrosion studies on HLW steel containers, 11:29316 (R;FR)
Materials Handling
Status of the waste removal system for the West Valley Demonstration Project, 11:29397 (RA;US)
Monitored Retrievable Storage
Simulation of the MRS receiving and handling facility, 11:29423 (BA;US)
Staff evaluation of US Department of Energy proposal for monitored retrievable storage, 11:29300 (R;US)
Packaging
Full scale tests on remote handled FFTF fuel assembly waste handling and packaging, 11:30340 (R;US)
Radioactive Waste Disposal
Heat pipe effects in nuclear waste isolation: a review, 11:29405 (R;US)
Scientific basis for nuclear waste management IX, 11:29420 (B;US)
Radioactive Waste Management
Management of high specific activity tritiated liquid wastes, 11:29407 (RA;US)
Radioactive Waste Processing
Analytical characterization of West Valley high-level waste sludge, 11:29396 (RA;US)
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)
Remote Handling
Full scale tests on remote handled FFTF fuel assembly waste handling and packaging, 11:30340 (R;US)
Solidification
Development of a grout-based stabilization method for spent high-temperature gas-cooled reactor fuel, 11:29380 (RA;US)
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)
Underground Disposal
Preliminary Hanford Waste Vitrification Plant waste form qualification plan, 11:29416 (R;US)
Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
Vitrification
Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)
Operating radioactive liquid-fed ceramic melter system, 11:29411 (R;US)
Preliminary Hanford Waste Vitrification Plant waste form qualification plan, 11:29416 (R;US)
Volume
Slurry growth: the characterization of a unique phenomenon at the Hanford Site, 11:29394 (RA;US)
HIGH-PURITY GE DETECTORS
Design
A new Compton densitometer for measuring pulmonary edema, 11:30665 (J;US)
Performance
High-purity germanium charged-particle detectors: A LBL-IUCF update, 11:30481 (J;NL)
HISTAMINE
Secretion
Test of a theory relating to the cross-linking of IgE antibody on the surface of human basophils, 11:30626 (J;US)
HO2
See HYDROPEROXY RADICALS
HOG FUEL
See WOOD WASTES
HOLIFIELD HEAVY ION RESEARCH FACILITY
See HHIRF ACCELERATOR
HOLLANDITE
Chemical Radiation Effects
Effects of alpha irradiation on barium hollandite and nickel-iron spinel, 11:30306 (J;US)
HOLMIUM 163
M Capture
Measurement of the mass of the electron neutrino using electron capture in ^{163}Ho, 11:30827 (RA;JP)
HOLOGRAPHY
S3T working group. Report 1: group aims (Time-space spectral signature), 11:30976 (R;FR;In French)
HONDURAS
Resource Development
Geothermal activities in Central America, 11:29981 (RA;US)
HONG KONG
Imports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
HOT CELLS
Radiation Monitoring
Stack monitor for the proof-of-breeding project, 11:30431 (J;US)
HOT ENRICHED CARBON MODERATED THERMAL OSC
See HECTOR REACTOR
HOT PLASMA
Ion Drift
Ion diffusion at interfaces in hot plasmas, 11:30983 (R;US)
Spin
Application of polarized ions to fusion reactors, 11:30974 (RA;JP)
HOT-DRY-ROCK SYSTEMS
Exploration
Exploration for Hot Dry Rock geothermal resources in the Midcontinent USA. Volume 1. Introduction, geologic overview, and data acquisition and evaluation, 11:29622 (R;US)

Geothermal Wells
Open hole packer and running procedure for Hot Dry Rock reservoir testing, 11:29633 (RA;US)
Measuring Methods
Inert and reacting tracers for reservoir sizing, 11:29632 (RA;US)
Well Drilling
Hot Dry Rock phase II reservoir engineering, 11:29631 (RA;US)
Well Stimulation
Hot Dry Rock phase II reservoir engineering, 11:29631 (RA;US)

HOUSES
Air Infiltration
Air leakage flow correlations for varying house construction types, 11:30002 (R;US)
Energy Consumption
Monitored performance of new, low-energy homes: updated results from the BECA-A data base, 11:30001 (R;US)
Indoor Air Pollution
Preliminary radon testing results for the Residential Standards Demonstration Program. Program results No. 3, 11:29905 (R;US)
Passive Solar Cooling Systems
Passive solar cooling house at King Faisal University, 11:29574 (RA;US)

HUGENHOLTZ-PINES THEORY
See HYDROGEN

HUMAN CELLS
See ANIMAL CELLS

HUMAN FACTORS
Research Programs
Application of SLIM-MAUD: a test of an interactive computer-based method for organizing expert assessment of human performance and reliability. Volume 1. Main report, 11:29853 (R;US)
Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2, 11:29792 (R;US)

HUMAN POPULATIONS
See also MINORITY GROUPS
Radiation Doses
Local and global deposition of radioactivity: a reassessment, 11:30697 (R;US)

HUMANS
See HUMAN POPULATIONS

HYBRID ELECTRIC-POWERED VEHICLES
Aerodynamics
Systems approach to the aerodynamic design of electric and hybrid vehicles, 11:30068 (BA;GB)
Computer-Aided Design
Computer-aided design of electric and hybrid vehicles, 11:30065 (BA;GB)
Design
Systems approach to the aerodynamic design of electric and hybrid vehicles, 11:30068 (BA;GB)
Technological advances in vehicle design: electric and hybrid vehicles, 11:30064 (B;GB)
Electric Batteries
Generic battery model for electric and hybrid vehicle simulation performance prediction, 11:30067 (BA;GB)
Meetings
Technological advances in vehicle design: electric and hybrid vehicles, 11:30064 (B;GB)

HYBRID REACTORS
Commercialization
An economic analysis of fusion breeders, 11:31120 (J;US)
Cost Benefit Analysis
An economic analysis of fusion breeders, 11:31120 (J;US)
Cost Estimation
An economic analysis of fusion breeders, 11:31120 (J;US)

HYDRATES
For chemical compounds or minerals.
Curie Point
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Ferrimagnetism
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Magnetic Susceptibility
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Phase Transformations
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)

HYDRAULIC FRACTURES
Crack Propagation
Quasi-static and dynamic arbitrary fracture propagation in jointed rock, 11:29252 (R;US)

HYDRAULIC FRACTURING FLUIDS
See FRACTURING FLUIDS

HYDRAULIC RAMS
See PUMPS

HYDROCARBONS
See also ALKANES
ALKENES
ANTHRACENE
BENZENE
BENZOPYRENE
NAPHTHALENE
POLYCYCLIC AROMATIC HYDROCARBONS
POLYENES
POLYPHENYLS
PYRENE
TETRACENE
TETRALIN
TOLUENE
XYLENES
Fires
Factors influencing pool fires on porous ground, 11:30544 (R;GB)
Thermal radiation hazard ranges from large hydrocarbon pool fires, 11:30563 (R;GB)

HYDROELECTRIC POWER
Energy Consumption
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume IA. Appendices with 1975 data. Final report, 11:29946 (R;US)

HYDROELECTRIC POWER PLANTS
See also MICRO-SCALE HYDROELECTRIC POWER PLANTS
Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)
Operating Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)

HYDROELECTRICITY
See HYDROELECTRIC POWER

HYDROGEN
Activation Energy
$F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
Adsorption
Dynamics of dissociative adsorption of hydrogen on Ni(100), 11:30216 (J;US)
Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
Atom-Atom Collisions
Reactive and inelastic energy transfer in $H+D_2$ collisions studied by single-collision CARS spectroscopy, 11:30819 (B;US)
Atom-Molecule Collisions
$F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
Chemical Preparation
Enhanced photoredox chemistry in quantized semiconductor colloids, 11:30289 (J;US)
Chemical Reaction Kinetics
Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986, 11:30194 (R;US)
$F + H_2$ potential energy surface: the ecstasy and the agony, 11:30215 (J;US)
Rate constant for the reaction $H + NH_3$ over the temperature range 750-1777 K, 11:30209 (J;US)
Chemical Reaction Yield
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)

Combustion
Hydrogen:air:steam flammability limits and combustion characteristics at intermediate scale, 11:29861 (R;US)
Electrochemistry
Hydrogen, 11:30220 (BA;US)
Leaks
Liquid to gas leak ratios with liquid nitrogen and liquid helium, 11:31190 (J;US)
Separation Processes
Eluent and ligand effects in cation chromatography, 11:30185 (D;US)
Yields
Long-term endurance and selection studies in hydrogen and oxygen photoproduction by Chlamydomonas reinhardtii, 11:29457 (J;GB)

HYDROGEN 1 MINUS BEAMS
Polarized Beams
Review of optically pumped polarized ion sources, 11:30418 (R;CA)
Status of the optically pumped polarized H^- ion source at TRIUMF, 11:30416 (R;CA)

HYDROGEN 1 TARGET
Pion Plus Reactions
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)

HYDROGEN 2
See DEUTERIUM

HYDROGEN 3
See TRITIUM

HYDROGEN COMPOUNDS
See also DEUTERIUM COMPOUNDS
HYDROGEN PEROXIDE
HYDROGEN SULFIDES
HYDROXIDES
WATER
Activation Energy
Reactions of HO_3 and O_3^- with iodine and bromine and the I_3^- and I atom reduction potentials, 11:30202 (J;US)
Chemical Reaction Kinetics
Reactions of HO_3 and O_3^- with iodine and bromine and the I_3^- and I atom reduction potentials, 11:30202 (J;US)
Chemical Reactions
Theoretical studies of the energetics and mechanisms of chemical reactions: abstraction reactions, 11:30206 (J;US)
Free Energy
Reactions of HO_3 and O_3^- with iodine and bromine and the I_3^- and I atom reduction potentials, 11:30202 (J;US)

HYDROGEN EMBRITTLEMENT
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)

HYDROGEN HYDROXIDES
See WATER

HYDROGEN IONS 1 MINUS
For H_1^- ions.
Ion Sources
Review of optically pumped polarized ion sources, 11:30418 (R;CA)
Status of the optically pumped polarized H^- ion source at TRIUMF, 11:30416 (R;CA)

HYDROGEN ISOTOPES
See also DEUTERIUM
TRITIUM
Pumping
Cryopumping hydrogen isotope mixtures in MFTF-B with and without argon adsorbent, 11:31254 (J;US)

HYDROGEN LOGS
See NEUTRON-GAMMA LOGGING

HYDROGEN MINUS 1 BEAMS
See HYDROGEN 1 MINUS BEAMS

HYDROGEN NITRATES
See NITRIC ACID

HYDROGEN PEROXIDE
Photolysis
$O(^3P)$ atoms formation by the photolysis of hydrogen peroxide in alkaline aqueous solutions, 11:30299 (J;US)
Redox Reactions
Cytotoxicity from coupled redox cycling of autoxidizing xenobiotics and metals: a selective critical review and commentary on work-in-progress, 11:30727 (J;IL)

HYDROGEN PHOSPHATES
See PHOSPHORIC ACID

HYDROGEN PRODUCTION
Photoelectrolysis
Photovoltaic-electrolyzer system performance results, 11:29458 (BA;CA)

HYDROGEN STORAGE
Materials Testing
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)

HYDROGEN SULFATES
See SULFURIC ACID

HYDROGEN SULFIDES
Adsorption
Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
Air Pollution Control
Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)
Catalytic Effects
In situ study of the hydrogenation of diphenyl ether in the presence of pyrrhotite and H_2S, 11:30257 (J;US)
Emission
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
Removal
Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)

HYDROGENATION
Catalysts
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)

HYDROLOGY
Monitoring
Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings, 11:30747 (R;US)

HYDROPEROXY RADICALS
HO_2
Oxidation
Measurements of the pressure dependence of the HO_3 radical self-disproportionation reaction at 298 K, 11:30207 (J;US)
Reduction
Measurements of the pressure dependence of the HO_3 radical self-disproportionation reaction at 298 K, 11:30207 (J;US)

HYDROXIDES
Radiolysis
Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)

HYDROXY COMPOUNDS
For organic compounds only and excluding SACCHARIDES, GLYCOSIDES and HYDROXY ACIDS.
See also ALCOHOLS
ESTRADIOL
PHENOLS
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986 (Hydroxyl aromatics), 11:29175 (R;US)
Mass Spectra
Separation and characterization of coal derived components, 1 January 1986-31 March 1986 (Hydroxyl aromatics), 11:29175 (R;US)

HYDROXYBENZENE
See PHENOL

HYDROXYL IONS
See ANIONS
HYDROXIDES
HYDROXYL RADICALS
Chemical Reaction Kinetics
Kinetics of the reaction OH + NH_3, 11:30208 (J;US)
Chemical Reactions
Hydrogen-atom abstraction from alkanes by OH. 2. Ethane, 11:30251 (J;US)
Photolysis
Hydrogen-atom abstraction from alkanes by OH. 2. Ethane, 11:30251 (J;US)
Pyrolysis
Kinetics of the reaction OH + NH_3, 11:30208 (J;US)
HYDROXYNAPHTHALENES
See NAPHTHOLS
HYDROXYSUCCINIC ACID
See MALIC ACID
HYDROXYTOLUENES
See CRESOLS
HYPERFRAGMENTS
See HYPERNUCLEI
HYPERNUCLEI
Weak Interactions
Nonleptonic weak interactions in hypernuclei, 11:30896 (R;US)
HYPERONS
Weak Hadronic Decay
Non-leptonic hyperon decays in the chiral bag model, 11:30865 (R;FR)
HYPERTHERMIA
Biological Effects
Inhibition by hyperthermia of repair synthesis and chromatin reassembly of ultraviolet-induced damage to DNA, 11:30700 (J;US)

I

IAEA SAFEGUARDS
Test Facilities
International Atomic Energy Agency UF_6 cascade header pipe test loop: safety assessment, 11:29453 (R;US)
I-BEAM TYPE REACTORS
See ION BEAM FUSION REACTORS
ICF DEVICES
Free Electron Lasers
Comparative study of free electron laser experiments in longitudinal and transverse wiggler geometries, 11:31070 (RA;JP)
ICR HEATING
Antennas
Experimental measurements of the ion cyclotron antennas' coupling and RF characteristics, 11:31193 (J;US)
ICRH coupling in DIII-D, 11:31028 (R;US)
Material and electromagnetic properties of Faraday shields for ion cyclotron heating antennas, 11:31191 (J;US)
Dispersion Relations
Theoretical and experimental study of modes associated to ion cyclotron heating on TFR, 11:30967 (R;FR;In French)
Efficiency
ICRF fusion reactivity enhancement in tokamaks, 11:30994 (J;AT)
Harmonics
Mode conversion of lower hybrid waves at high ion cyclotron harmonics. Appendix F, 11:30963 (R;US)
RF Systems
Materials problems for highly irradiated ICRH Launchers in fusion reactors, 11:31195 (J;US)
Wave Propagation
Radio frequency vacuum feedthroughs for high-power ICRF heating applications, 11:31192 (J;US)
Theoretical and experimental study of modes associated to ion cyclotron heating on TFR, 11:30967 (R;FR;In French)
Theory of feedthroughs: wave transmission and voltage characteristics of high-power current feeds for ICRH, 11:31199 (J;US)
Waveguides
ICRF heating technology development activities at Oak Ridge National Laboratory, 11:31026 (R;US)
IDAHO
Watersheds
Biological and physical inventory of the streams within the Nez Perce Reservation. Synopsis of three years of stream inventory on the Nez Perce Reservation. Final report 1985, 11:30621 (R;US)
IDAHO ADVANCED TEST REACTOR
See ATR REACTOR
IDAHO NATIONAL ENGINEERING LABORATORY
Prior to 1976 known as NRTS and older material is so indexed.
Radioactive Waste Management
Options for treatment, storage, and/or disposal of radioactive mixed waste at the Idaho National Engineering Laboratory, 11:29334 (RA;US)
Research Programs
INEL injection research: physical model studies, 11:29911 (RA;US)
IEA
See INTERNATIONAL ENERGY AGENCY
IGNEOUS ROCKS
Radionuclide Migration
Scientific basis for nuclear waste management IX, 11:29420 (B;US)
IGNITION SYSTEMS
Design
Cold-start tests with speed diesel engines using alcohol as main fuel, 11:30042 (R;FI;In Finnish)
IGT WASTE PROCESS
See BIOGAS PROCESS
ILLINOIS
Dolomite
Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985, 11:30758 (R;US)
ILLITE
Thermal Conductivity
Thermal properties of clay-based buffer materials for a nuclear fuel waste disposal vault, 11:30147 (R;CA)
ILLUMINATION SYSTEMS
See LIGHTING SYSTEMS
IMAGE PROCESSING
Parallel Processing
Algorithms + Alchemy = Architectures, 11:31290 (BA;US)
IMAGE TUBES
Photoconductivity
Radiation effects on video imagers, 11:30494 (J;US)
Physical Radiation Effects
Radiation effects on video imagers, 11:30494 (J;US)
IMMEDIATE RADIATION EFFECTS
See EARLY RADIATION EFFECTS
IMMUNOGLOBULINS
Biochemical Reaction Kinetics
Test of a theory relating to the cross-linking of IgE antibody on the surface of human basophils, 11:30626 (J;US)
IMPACT SHOCK
Computer Codes
Verification study of SHELL SHOCK, 11:31285 (R;US)
IMPACT TESTS
Test Facilities
Development of a large unyielding target for packaging tests, 11:30348 (R;US)
IMPERMEABLE DRY ROCK
See HOT-DRY-ROCK SYSTEMS
IMPLOSIONS
See also LASER IMPLOSIONS
Computerized Simulation
Simulation of LIB target implosion, 11:31073 (RA;JP)
Equations of State
Equation of state for fuel and target implosion, 11:31071 (RA;JP)

IMPURITIES
Unwanted constituents, not for TRACE AMOUNTS, INTERFERING ELEMENTS, or metal and nonmetal additions.
Control
An impurity control test facility (ICTF) for the study of fusion reactor/plasma edge materials, 11:31161 (J;US)
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
Impurity control and vacuum pumping system design and analysis for next-generation tokamaks, 11:31153 (J;US)
Poloidal divertor systems for impurity and particle control in ignition Tokamaks, 11:31138 (J;US)
The engineering and material aspects of impurity control systems, 11:31139 (J;US)
Diffusion
The source of heavy impurities in the Alcator C Tokamak, 11:31021 (BA;US)
Magnetic Materials
Magnetic impurities in superconductors. Performance report, July 1, 1985-June 30, 1986, 11:30337 (R;US)
IN CORE INSTRUMENTS
See also specific instruments plus FUEL ASSEMBLIES or REACTOR CORES.
Self-Powered Neutron Detectors
In-core measurements with platinum self powered detectors in a French PWR, 11:29756 (R;FR)
IN UTERO IRRADIATION
See PRENATAL IRRADIATION
INCIDENTS
See ACCIDENTS
INCINERATION
See COMBUSTION
INCOLOY 800
Mechanical Properties
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
INCOLOY 800H
Corrosion
Study of metallic materials behavior in low oxygen activity atmospheres (Corrosion of alloy 800 H and steel 316L for coal gasification structural materials), 11:30077 (R;FR;In French)
INCOMPRESSIBLE FLOW
Computer Codes
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
Three-Dimensional Calculations
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
INCONEL 600
Intergranular Corrosion
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
Materials Testing
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
Reactor Materials
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
Stress Corrosion
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
INCONEL 625
Heat Transfer
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
INDIA
Biomass Conversion Plants
Biogas supply for the fictitious village of Kama in India. Case study, 11:29462 (RA;DE)
Community biogas programmes of Gram Vikas, 11:29472 (RA;DE)
India's experiment with community biogas plants. Case study, 11:29500 (RA;DE)
Some thoughts on the Community Biogas Plants, 11:29473 (RA;DE)
INDIANA
Oil Shale Deposits
Update on the American Syn-Crude/Indiana Shale Oil Project, 11:29272 (BA;US)
INDIUM ARSENIDES
Carrier Lifetime
Comparison of Auger recombination in GaInAs-AlInAs multiple quantum well structure and in bulk GaInAs, 11:30156 (RA;AT)
Superlattices
Dislocation reduction in epitaxial GaAs on Si (100), 11:30165 (J;US)
INDIUM OXIDES
Phase Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
INDIUM PHOSPHIDES
Surface Properties
Surface-enhanced resonance Raman study of the photoreduction of methylviologen on a p-InP semiconductor electrode, 11:30285 (J;US)
INDIUM SELENIDE SOLAR CELLS
Fabrication
Photoluminescence studies of CuIn-Se_2 thin films and crystals, 11:29552 (BA;US)
Status of photovoltaics R & D at SERI, 11:29548 (BA;US)
Thin-film tandem solar cells based on $CuInSe_2$, 11:29550 (BA;US)
Physical Radiation Effects
Photon radiation effects on CdS/CuInSe2 thin film solar cells, 11:29533 (RA;US)
INDIUM SELENIDES
Crystal Defects
Photoluminescence studies of CuIn-Se_2 thin films and crystals, 11:29552 (BA;US)
Photoluminescence
Photoluminescence studies of CuIn-Se_2 thin films and crystals, 11:29552 (BA;US)
INDOLES
Structural Chemical Analysis
Structure chemistry, 11:30192 (RA;ZA;In Afrikaans)
INDUSTRIAL LAUNDRIES
See LAUNDRIES
INDUSTRIAL PLANTS
See also CHEMICAL PLANTS
COAL GASIFICATION PLANTS
COAL LIQUEFACTION PLANTS
COAL PREPARATION PLANTS
METHANOL PLANTS
OIL SHALE PROCESSING PLANTS
Air Pollution
Forecasting future industrial SO_x and NO/sub x/ emissions, 11:30551 (J;US)
Cooling Systems
Fouling control in cooling systems using brackish water, 11:29681 (R;FI;In Finnish)
Decontamination
Auburn Steel Company radioactive contamination incident, 11:29408 (R;US)
Energy Conservation
Improvement of the energy economy of industrial lightning, 11:30025 (R;FI;In Finnish)
Heat Pumps
Heat pumps for district heating of smaller cities, 11:30024 (R;FI;In Finnish)
Lighting Systems
Improvement of the energy economy of industrial lightning, 11:30025 (R;FI;In Finnish)
Thermal Insulation
Thermophysical properties of industrial insulators, 11:30021 (J;GB)

Waste Heat Utilization
Heat pumps for district heating of smaller cities, 11:30024 (R;FI;In Finnish)

INDUSTRIAL RADIOGRAPHY
See also BIOMEDICAL RADIOGRAPHY.
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

INDUSTRIAL WASTES
See also SPENT LIQUORS
Ground Disposal
Depositions of environmental pollutants, 11:30023 (R;DE;In German)
Transfrontier Pollution
Pollution problems in border karst regions, 11:30610 (R;IT)

INERTIAL CONFINEMENT
A dynamic plasma confinement by inertial forces.
Krypton Fluoride Lasers
Megajoule-class single-pulse KrF laser test facility as a logical step toward inertial fusion commercialization, 11:31229 (J;US)
Scaling of KrF lasers for inertial confinement fusion, 11:31092 (J;US)

INERTIAL CONFINEMENT FUSION DEVICES
See ICF DEVICES

INFORMATION SYSTEMS
Data Processing
Data processing in the integrated data base for spent fuel and radioactive waste, 11:29421 (BA;US)
Planning
National energy information system for Finland, 11:29917 (R;FI;In Finnish)

INHALATION EXPOSURE CHAMBERS
See EXPOSURE CHAMBERS

INHOMOGENEOUS PLASMA
High-Frequency Heating
Complex geometric optics theory in an inhomogeneous plasma. Appendix B, 11:30962 (R;US)

INORGANIC COMPOUNDS
Use of a more specific term is recommended.
Research Programs
[Council for Scientific and Industrial Research, National Chemical Research Lab.]. Annual report 1985, 11:30193 (R;ZA;In Afrikaans)
Inorganic compounds for passive solar energy storage. Solid-state dehydration materials and high specific heat materials. Progress report, 11:29612 (R;US)

INSECTICIDES
Biological Effects
Effects of pesticide on biota and breakdown of forest litter, 11:30703 (BA;RO)

IN-SERVICE INSPECTION
Research Programs
Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2, 11:29792 (R;US)

IN-SITU GASIFICATION
Environmental Effects
Underground coal gasification: environmental update, 11:29171 (B;US)
Research Programs
The Centralia partial seam CRIP underground coal gasification experiment (Controlled retracting injection point), 11:29172 (B;US)
The METC underground coal gasification research program for eastern bituminous coals, 11:29170 (B;US)
Underground coal gasification: status and promise, 11:29173 (B;US)

IN-SITU RETORTING
Gaseous Wastes
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)
Mathematical Models
Pressure loss in packed beds of low void fraction, 11:29267 (BA;US)

INSTALLATION
Verification
Methods for verifying strain gage installations, 11:30345 (R;US)

INSULATING LIMITERS
See LIMITERS

INSULATION (THERMAL)
See THERMAL INSULATION

INSULATORS (ELECTRICAL)
See ELECTRICAL INSULATORS

INTEGRATED CIRCUITS
Computer-Aided Design
Introduction to semi-custom integrated circuits, 11:30436 (J;US)

INTERACTIVE DISPLAY DEVICES
Personal Computers
A low-cost general purpose spectral display unit using an IBM PC, 11:30438 (J;US)

INTERACTIVE GRAPHICS
See INTERACTIVE DISPLAY DEVICES

INTERMEDIATE IMAGE SPECTROMETER
See MAGNETIC LENS SPECTROMETERS

INTERMEDIATE-LEVEL RADIOACTIVE WASTES
Radioactive Waste Disposal
Fifteen years of radioactive waste management at Ontario Hydro, 11:29372 (RA;US)
Transition from storage to permanent disposal of low- and intermediate-level wastes at the Chalk River Nuclear Laboratories, 11:29324 (RA;US)
Radioactive Waste Processing
Fifteen years of radioactive waste management at Ontario Hydro, 11:29372 (RA;US)
SETH 200: new mobile unit for spent ion-exchange resins embedding in polymers, 11:29343 (RA;US)
Solidification
Cementation of radioactive wastes in the Federal Republic of Germany, 11:29377 (RA;US)

INTERMEDIATES (REACTION)
See REACTION INTERMEDIATES

INTERMETALLIC COMPOUNDS
Ductility
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Research Programs
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Tensile Properties
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Welding
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

INTERNAL COMBUSTION ENGINES
See also DIESEL ENGINES
RAMJET ENGINES
SPARK IGNITION ENGINES
Fuel Injection Systems
Air blast type coal slurry fuel injector, 11:29224 (P;US)
Fuel Substitution
Air blast type coal slurry fuel injector, 11:29224 (P;US)
Patterns of vehicle misfueling in 1981 and 1982: where, when, what vehicles, and how often?, 11:30044 (B;US)
Historical Aspects
The knock syndrome - its cures and its victims, 11:30043 (B;US)
Knock Control
The knock syndrome - its cures and its victims, 11:30043 (B;US)

INTERNATIONAL COOPERATION
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

INTERNATIONAL ENERGY AGENCY
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

INTERNATIONAL TOKAMAK REACTOR
See INTOR TOKAMAK

INTOR TOKAMAK
International Tokamak Reactor.
Coordinated Research Programs
Technical benefit of an international project, 11:31126 (J;US)

Impurities
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
International Cooperation
Technical benefit of an international project, 11:31126 (J;US)
Maintenance
A comparison of all-remote and personnel access maintenance operations for INTOR, 11:31131 (J;US)
Materials Handling
A comparison of all-remote and personnel access maintenance operations for INTOR, 11:31131 (J;US)
Protective Coatings
Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
Remote Handling
A comparison of all-remote and personnel access maintenance operations for INTOR, 11:31131 (J;US)
Thermal Shields
Nuclear responses in INTOR plasma stabilization elements, 11:31135 (J;US)
Thermonuclear Reactor Materials
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)

INTRANUCLEAR CASCADES
See NUCLEAR CASCADES

INVENTORIES
Errors
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)

INVERTEBRATES
Biological Extinction
Impact theory of mass extinctions and the invertebrate fossil record, 11:30573 (J;US)

IODEX PROCESS
See IODOX PROCESS

IODIDES
Oxidation
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Photochemistry
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)

IODINE
Activation Energy
Reactions of HO_2 and O_2^- with iodine and bromine and the I_2^- and I atom reduction potentials, 11:30202 (J;US)
Chemical Reaction Kinetics
Photochemical method for radioiodine abatement, 11:29311 (R;CA)
Reactions of HO_2 and O_2^- with iodine and bromine and the I_2^- and I atom reduction potentials, 11:30202 (J;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Free Energy
Reactions of HO_2 and O_2^- with iodine and bromine and the I_2^- and I atom reduction potentials, 11:30202 (J;US)
Volatility
Studies of the volatility of cesium and iodine, 11:30189 (RA;US)

IODINE 127
Radioactive Waste Processing
Photochemical method for radioiodine abatement, 11:29311 (R;CA)

IODINE 129
Biological Accumulation
Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington, 11:30585 (J;NL)
Dose Rates
Calculation of dose rates from critical radionuclides in low-level radioactive waste disposal, 11:29444 (RA;US)
Leaching
Leach resistance of iodine compounds in Portland cement, 11:29425 (J;US)
Radioactive Waste Processing
Photochemical method for radioiodine abatement, 11:29311 (R;CA)
Radioecological Concentration
Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington, 11:30585 (J;NL)
Uptake
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)

IODINE 131
Radioactive Waste Processing
Photochemical method for radioiodine abatement, 11:29311 (R;CA)
Radioecological Concentration
Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington, 11:30585 (J;NL)

IODINE COMPOUNDS
See also IODIDES
Stability
Leach resistance of iodine compounds in Portland cement, 11:29425 (J;US)

IODINE IODIDES
See IODINE

IODOX PROCESS
Consolidated Fuel Reprocessing Program. Progress report, October 1-December 31, 1985, 11:29296 (R;US)

ION BEAM FUSION REACTORS
Commercialization
ICF reactor economics: identifying the high leverage design features, 11:31231 (J;US)
Cost Benefit Analysis
ICF reactor economics: identifying the high leverage design features, 11:31231 (J;US)
Design
ICF reactor economics: identifying the high leverage design features, 11:31231 (J;US)
Energy Accounting
ICF reactor economics: identifying the high leverage design features, 11:31231 (J;US)
Inertial Confinement
ICF reactor economics: identifying the high leverage design features, 11:31231 (J;US)

ION BEAM TARGETS
Implosions
Effect of nonuniform implosion of target on fusion parameters, 11:31072 (RA;JP)
Equation of state for fuel and target implosion, 11:31071 (RA;JP)
Simulation of LIB target implosion, 11:31073 (RA;JP)
Nonuniform Irradiation
Effect of nonuniform implosion of target on fusion parameters, 11:31072 (RA;JP)

ION BEAM TYPE REACTORS
See ION BEAM FUSION REACTORS

ION BEAMS
See also DEUTERON BEAMS
HYDROGEN 1 MINUS BEAMS
LITHIUM 6 BEAMS
Beam Dynamics
Transverse electric fields inferred from electron losses and ion beam dynamics in a Magnetically Insulated Diode, 11:31019 (BA;US)
Scattering
Transverse electric fields inferred from electron losses and ion beam dynamics in a Magnetically Insulated Diode, 11:31019 (BA;US)

ION CLUSTERS
See ION PAIRS

ION CYCLOTRON-RESONANCE HEATING
See ICR HEATING

ION DETECTION
Drift Chambers
New focal plane detector for the magnet spectrometer Big Karl, 11:30480 (J;NL)
Plastic Scintillation Detectors
Plastic scintillator response to relativistic nuclei, Z<=28, 11:30484 (J;NL)
ION EXCHANGE
Optimization
Radwaste ion-exchange optimization, 11:29392 (RA;US)
ION EXCHANGE CHROMATOGRAPHY
Resins
Selectivity variations in anion chromatography, 11:30184 (D;US)
ION EXCHANGE MEMBRANES
See MEMBRANES
ION PAIRS
Structural Chemical Analysis
Structure and dynamics of olefin radical cation aggregates. Time-resolved fluorescence detected magnetic resonance, 11:30301 (J;US)
ION SOURCES
Beam Monitoring
An alpha particle diagnostic beam line system to generate an intense Li^{0} beam with an ORNL SITEX source, 11:31200 (J;US)
Beam Optics
An alpha particle diagnostic beam line system to generate an intense Li^{0} beam with an ORNL SITEX source, 11:31200 (J;US)
Design
Single-ring magnetic cusp low gas pressure ion source, 11:30668 (P;US)
Electrodes
Cesium transpiration through a negative-ion forming electrode, 11:31266 (BA;US)
Erosion
Cesium transpiration through a negative-ion forming electrode, 11:31266 (BA;US)
Optical Pumping
Review of optically pumped polarized ion sources, 11:30418 (R;CA)
Status of the optically pumped polarized H^{-} ion source at TRIUMF, 11:30416 (R;CA)
Reviews
Liquid metal field emission thrusters and ion sources: a review. Final report, 11:30032 (R;GB)
ION TEMPERATURE
Doppler Broadening
A photon-counting detector for doppler width ion temperature measurements, 11:31016 (BA;US)
Photoelectron Counting
A photon-counting detector for doppler width ion temperature measurements, 11:31016 (BA;US)
Plasma Diagnostics
A photon-counting detector for doppler width ion temperature measurements, 11:31016 (BA;US)
ION THRUSTERS
Reviews
Liquid metal field emission thrusters and ion sources: a review. Final report, 11:30032 (R;GB)
IONIZATION CALORIMETERS
See SHOWER COUNTERS
IONOSPHERE
Plasma Instability
BUARO PSD vs height, 11:30808 (R;US)
Probes
BUARO PSD vs height, 11:30808 (R;US)
IONS (ATOMIC)
See ATOMIC IONS
IOWA
Dolomite
Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985, 11:30758 (R;US)
IRON
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Fracture Properties
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Hydrogen Embrittlement
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Neutron Transport
Transmission of fast neutrons through an iron sphere, 11:31091 (J;US)
Permeability
Summary abstract: reduction of tritium permeation through iron using aluminum ion implantation, 11:30113 (J;US)
Physical Radiation Effects
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys (Candidate window materials for SIN beam stop), 11:30099 (R;US)
Stress Corrosion
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Sulfidation
Microstructures and growth rates of FeS on pure and not-so-pure iron, 11:30227 (J;US)
IRON 54 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
IRON 56 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Neon 20 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
IRON 57 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
IRON 59
Diffusion
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
IRON ALLOYS
See also HASTELLOYS
INCONEL 600
INCONEL 625
IRON BASE ALLOYS
VANSTAR 7
Fracture Properties
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Hydridation
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)
Physical Radiation Effects
Effects of irradiation on low activation ferritic alloys, 11:31062 (RA;US)
IRON BASE ALLOYS
See also STEELS
Corrosion Resistance
Research on erosion and corrosion of cobalt-free materials, 11:30093 (R;FR;In German)
Heat Treatments
Maraging superalloys and heat treatment processes, 11:30107 (P;US)

Materials Testing
FY 1984 and FY 1985 geochemistry and materials studies in support of the Magma Energy Extraction Program, 11:29639 (R;US)
Microstructure
Maraging superalloys and heat treatment processes, 11:30107 (P;US)

IRON COMPLEXES
Carbonylation
Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986, 11:30236 (R;US)
Cations
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Electron Transfer
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Photochemical Reactions
Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study, 11:30296 (J;GB)
Radicals
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Raman Effect
Surface Raman scattering and electrochemistry of iron protoporphyrin IX at a polycrystalline silver electrode, 11:30282 (J;US)
Synthesis
Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986, 11:30236 (R;US)
Voltametry
Surface Raman scattering and electrochemistry of iron protoporphyrin IX at a polycrystalline silver electrode, 11:30282 (J;US)

IRON COMPOUNDS
See also IRON FLUORIDES
IRON OXIDES
IRON SULFIDES
Chemical Radiation Effects
Effects of alpha irradiation on barium hollandite and nickel-iron spinel, 11:30306 (J;US)
Nutritional Deficiency
Membrane development in the cyanobacterium, Anacystis nidulans, during recovery from iron starvation, 11:30671 (J;US)

IRON FLUORIDES
Curie Point
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Ferrimagnetism
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Magnetic Susceptibility
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Phase Transformations
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)

IRON ISOTOPES
See also IRON 59
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)

IRON OXIDES
Catalytic Effects
Crystallite size effect in the selective oxidation of butene to butadiene on iron oxide. 1. Moessbauer, X-ray, and magnetization characterization of the catalysts, 11:30229 (J;US)
In situ study of the hydrogenation of diphenyl ether in the presence of pyrrhotite and H_2S, 11:30257 (J;US)
Corrosion
Sulfur diffusion in oxide grain boundaries, 11:30117 (J;GB)
Electrochemical Corrosion
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Oxidation
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Photochemistry
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Radiolysis
Enhancement of neutralization reaction in colloidal ferric hydrous oxide, 11:30305 (J;GB)

IRON SULFIDES
Crystal Defects
Accuracy of the linear gradient approximation for diffusion-controlled growth of iron sulfide, 11:30142 (J;US)
Crystal Growth
Microstructures and growth rates of FeS on pure and not-so-pure iron, 11:30227 (J;US)
Microstructure
Microstructures and growth rates of FeS on pure and not-so-pure iron, 11:30227 (J;US)
Scaling
Accuracy of the linear gradient approximation for diffusion-controlled growth of iron sulfide, 11:30142 (J;US)

IRON-FREE SPECTROMETERS
See FLAT MAGNETIC SPECTROMETERS

IRON-NICKEL BATTERIES
Electrodes
Post-test analyses of Na/S cells and aqueous batteries, 11:29898 (RA;US)

IRRADIATION DEVICES
Characterization of the National Low-Temperature Neutron Irradiation Facility, 11:29818 (R;US)

IRRADIATION RIGS
See IRRADIATION DEVICES

ISOLATED LOCATIONS
See REMOTE AREAS

ISOMERS
Only for geometrical isomers and stereoisomers in chemistry; see also ISOMERIC NUCLEI and FISSION ISOMERS.
Structural Chemical Analysis
Identifying alkylbenzene isomers with chemical ionization-proton exchange mass spectrometry, 11:30268 (J;US)

ISOTOPE ANALYSIS (QUANTITATIVE)
See ISOTOPE RATIO

ISOTOPE COMPOSITION (QUANTITATIVE)
See ISOTOPE RATIO

ISOTOPE DATING
Cyclotrons
Low energy cyclotron for radiocarbon dating, 11:30410 (R;US)

ISOTOPE RATIO
Seasonal Variations
Stable-carbon isotopic composition of maple sap and foliage, 11:30631 (J;US)

ISOTOPES
See also FISSION PRODUCTS
HYDROGEN ISOTOPES
IRON ISOTOPES
OXYGEN ISOTOPES
RADIOISOTOPES
RARE EARTH ISOTOPES
SILVER ISOTOPES
ZINC ISOTOPES
Alpha Spectroscopy
Alpha counting and spectrometry using liquid scintillation methods, 11:30312 (R;US)
Qualitative Chemical Analysis
Alpha counting and spectrometry using liquid scintillation methods, 11:30312 (R;US)

ISOTOPIC ANALYSIS (QUANTITATIVE)
See ISOTOPE RATIO

ISOTOPIC COMPOSITION (QUANTITATIVE)
See ISOTOPE RATIO
ISX TOKAMAK
Limiters
Thermomechanical testing of beryllium for limiters in ISX-B and jet, 11:31238 (J;US)

J

J-3105 RESONANCES
See PSI-3105 RESONANCES
JAILS
See PUBLIC BUILDINGS
JAMAICA
Energy Supplies
Jamaica - energy situation 1984, 11:29923 (R;DE;In German)
JAPAN
Electric Power Industry
Coal power plant in Japan, especially in EPDC's case with advanced combustion and cleaning technique, 11:29678 (R;SE)
Fossil-Fuel Power Plants
Coal power plant in Japan, especially in EPDC's case with advanced combustion and cleaning technique, 11:29678 (R;SE)
Imports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
PWR Type Reactors
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Technology Transfer
Information flow from Japan to US researchers in applied and basic energy research fields, 11:29919 (J;US)
JET MODEL
Reviews
Jet fragmentation, 11:30875 (R;GB)
JET REACTORS
See JET TOKAMAK
JET TOKAMAK
ICR Heating
Material and electromagnetic properties of Faraday shields for ion cyclotron heating antennas, 11:31191 (J;US)
Limiters
Thermomechanical testing of beryllium for limiters in ISX-B and jet, 11:31238 (J;US)

K

KAOLIN
Thermal Conductivity
Thermal properties of clay-based buffer materials for a nuclear fuel waste disposal vault, 11:30147 (R;CA)
KAON MINUS-PROTON INTERACTIONS
Scattering Amplitudes
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^- p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)
Scattering Lengths
Constant scattering length fits to low energy Kp interactions, 11:30844 (R;GB)
Strong Interactions
Constant scattering length fits to low energy Kp interactions, 11:30844 (R;GB)
Total Cross Sections
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)
KAON-NUCLEON INTERACTIONS
Partial Waves
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1983-April 30, 1984, 11:30854 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1982-April 30, 1983, 11:30853 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1980-April 30, 1981, 11:30852 (R;US)
Partial wave analysis of π-N, NN, and KN scattering below 2 GeV. Progress report, June 1, 1979-May 31, 1980, 11:30851 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1984-April 30, 1985, 11:30855 (R;US)
Partial wave analyses of hadron scattering below 2 GeV. Progress report, May 1, 1985-April 30, 1986, 11:30856 (R;US)
KAONS
Particle Production
K-meson production by nu/sub μ/-deuterium reactions near threshold: implications for nucleon-decay searches, 11:30824 (R;US)
KARLSRUHE NUCLEAR RESEARCH CENTER
See KERNFORSCHUNGSZENTRUM KARLSRUHE
KEK INTERS. STORAGE ACCELERATOR
See TRISTAN STORAGE RINGS
KERNFORSCHUNGSZENTRUM KARLSRUHE
Personnel Monitoring
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)
KETONES
See also ACETONE
ACETOPHENONE
BENZOPHENONE
Pyrolysis
Measurement of the dipole moment of a peroxyl radical by microwave dielectric absorption, 11:30274 (J;US)
KIDNEYS
Contamination
Cadmium retention in the kidneys of chicks as influenced by phytate in the feed, 11:30718 (R;DE;In German)
KINASES
See PHOSPHOTRANSFERASES
KINASES (PHOSPHOTRANSFERASES)
See PHOSPHOTRANSFERASES
KOREA (SOUTH)
See REPUBLIC OF KOREA
KRYPTON
Fission Products
Effects of time and other variables on fission product release rates, 11:29748 (R;US)
Thermal Diffusion
Mound activities in chemical and physical research: July-December 1985, 11:30196 (R;US)
KRYPTON 86 REACTIONS
Compound-Nucleus Reactions
Study of transitional Erbium nuclei (N=86) at very high spin. Highlight of dipolar transitions and medium lifetimes in the continuum, 11:30909 (R;FR;In French)
KRYPTON COMPOUNDS
See also KRYPTON FLUORIDES
Photoionization
Predissociation and ionization of excited KrXe observed using resonantly enhanced multiphoton ionization-photoelectron spectroscopy, 11:30293 (J;NL)
KRYPTON FLUORIDE LASERS
Commercialization
Megajoule-class single-pulse KrF laser test facility as a logical step toward inertial fusion commercialization, 11:31229 (J;US)
Design
Design optimization of single-main-amplifier KrF laser-fusion systems, 11:31230 (J;US)
Scaling of KrF lasers for inertial confinement fusion, 11:31092 (J;US)

Performance
Scaling of KrF lasers for inertial confinement fusion, 11:31092 (J;US)
Pulse Amplifiers
Design optimization of single-main-amplifier KrF laser-fusion systems, 11:31230 (J;US)
Scaling Laws
Scaling of KrF lasers for inertial confinement fusion, 11:31092 (J;US)
Test Facilities
Megajoule-class single-pulse KrF laser test facility as a logical step toward inertial fusion commercialization, 11:31229 (J;US)
KRYPTON FLUORIDES
Pyrolysis
Mechanism of thermal decomposition of krypton difluoride, 11:30233 (TJ;US)
KRYPTONATES
See KRYPTON COMPOUNDS
KUWAIT
Energy Supplies
Kuwait - energy situation 1984, 11:29929 (R;DE;In German)

L

LA REINA REACTOR
See RESEARCH REACTORS
LAKE ONTARIO
Monitoring
Using aquatic simulation models for impact assessment: evaluation of monitoring programs, 11:30614 (RA;US)
LAKES
Limnology
Control of productivity and population characteristics in aquatic communities. Progress report, 1 September 1982-31 August 1983, 11:30594 (R;US)
LAMBS
See SHEEP
LAND APPLICATION
See GROUND DISPOSAL
LAND POLLUTION
Meetings
Perspectives on nonpoint source pollution - proceedings of a national conference, 11:29188 (R;US)
LAND RECLAMATION
Financing
Coal industry perspectives on nonpoint source pollution, 11:29191 (RA;US)
Pollution Abatement
Trends in post-mining land uses - are we doing our children justice?, 11:29190 (RA;US)
Recommendations
Trends in post-mining land uses - are we doing our children justice?, 11:29190 (RA;US)
Regulations
Coal industry perspectives on nonpoint source pollution, 11:29191 (RA;US)
LAND USE
Economic Analysis
Land use model with a constant-utility spatially variant wage, 11:30592 (J;US)
LANGMUIR OSCILLATIONS
See PLASMA WAVES
LANTHANUM
Radioecological Concentration
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Tissue Distribution
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
LANTHANUM CHROMITES
See CHROMIUM OXIDES
LANTHANUM COMPOUNDS
Crystal-Phase Transformations
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Formation Free Energy
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Specific Heat
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Stability
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
LARGE COIL PROGRAM
Superconducting Magnets
Experience with operation of a large magnet system in the international fusion superconducting magnet test facility, 11:31170 (J;US)
Partial-array test results in IFSMTF, 11:31171 (J;US)
LASER FUSION REACTORS
See also CASCADE REACTORS
Breeding Blankets
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)
Commercialization
KrF laser cost/performance model for ICF commercial applications, 11:31227 (J;US)
Computerized Simulation
KrF laser cost/performance model for ICF commercial applications, 11:31227 (J;US)
Coolants
A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor, 11:31222 (J;US)
Design
The Pulse Star inertial confinement fusion reactor, 11:31223 (J;US)
Inertial Confinement
A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor, 11:31222 (J;US)
KrF laser cost/performance model for ICF commercial applications, 11:31227 (J;US)
The Pulse Star inertial confinement fusion reactor, 11:31223 (J;US)
Krypton Fluoride Lasers
Design optimization of single-main-amplifier KrF laser-fusion systems, 11:31230 (J;US)
KrF laser cost/performance model for ICF commercial applications, 11:31227 (J;US)
Megajoule-class single-pulse KrF laser test facility as a logical step toward inertial fusion commercialization, 11:31229 (J;US)
Performance
KrF laser cost/performance model for ICF commercial applications, 11:31227 (J;US)
Thermonuclear Reactor Cooling Systems
A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor, 11:31222 (J;US)
LASER IMPLOSIONS
Proton Spectra
Analysis of doublet proton spectra from laser implosion experiments, 11:31256 (J;US)
LASER ISOTOPE SEPARATION
Production of a Raman laser at 16 μm, 11:29290 (R;FR;In French)
LASER RADIATION
Beam Optics
Scattering apodizer for laser beams, 11:30366 (P;US)
Beam Shaping
Scattering apodizer for laser beams, 11:30366 (P;US)
Diffraction
Scattering apodizer for laser beams, 11:30366 (P;US)
Scattering
Scattering apodizer for laser beams, 11:30366 (P;US)
LASER-PRODUCED PLASMA
Reviews
High energy laser plasma accelerators, 11:31093 (J;GB)

X-Ray Sources
Dynamical aspects of the picosecond x-ray generation from laser-produced plasmas, 11:30373 (BA;US)
X-Ray Spectra
Experimental and simulation studies on soft-X-ray emission from 0.53 micron-laser irradiated solid targets, 11:30374 (BA;US)

LASERS
Light Amplification by Stimulated Emission of Radiation.
See also FREE ELECTRON LASERS
GAS LASERS
X-RAY LASERS
Amplification
Q-switched raman laser system, 11:30367 (P;US)
Brillouin Effect
Q-switched raman laser system, 11:30367 (P;US)
Design
Q-switched raman laser system, 11:30367 (P;US)
Q-Switching
Q-switched raman laser system, 11:30367 (P;US)
Raman Effect
Q-switched raman laser system, 11:30367 (P;US)

LATE RADIATION EFFECTS
See DELAYED RADIATION EFFECTS

LATENT HEAT STORAGE
Materials
Inorganic compounds for passive solar energy storage. Solid-state dehydration materials and high specific heat materials. Progress report, 11:29612 (R;US)

LATTICES (CRYSTAL)
See CRYSTAL LATTICES

LATTICES (REACTOR)
See REACTOR LATTICES

LAUNDRIES
Inventories
Hanford regulated laundry: inventory control and production improvement study, 11:30344 (R;US)
Productivity
Hanford regulated laundry: inventory control and production improvement study, 11:30344 (R;US)

LAURIC ACID
See DODECANOIC ACID

LAWRENCE BERKELEY LABORATORY
Research Programs
Brine injection studies, 11:29912 (RA;US)
Geothermal reservoir technology, 11:29614 (RA;US)

LAWRENCE LIVERMORE LABORATORY
Education
Training and development and education at Lawrence Livermore National Laboratory, 11:31273 (R;US)
Training
Training and development and education at Lawrence Livermore National Laboratory, 11:31273 (R;US)

LEACHATES
Chemical Composition
Study of the conditions of formation and emission of trace element pollutants from the combustion of coal in industrial fires, 11:29199 (R;XE)
Gas Chromatography
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Liquid Column Chromatography
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

LEACHING
Simulation
Hydrothermal flow-through apparatus to simulate leaching of nuclear waste forms under quasi-dynamic conditions, 11:29431 (R;CA)

LEAD
Casting
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Ecological Concentration
Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States, 11:30524 (R;US)
Environmental Transport
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)
Heat Transfer
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
Neon 20 Reactions
Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions, 11:30906 (R;JP)
Root Absorption
Transfer soil to plant (Lolium multiflorum) of cobalt, chromium, and lead, 11:30719 (R;DE;In German)

LEAD 208
Giant Resonance
Spin excitations in ^{208}Pb, 11:30923 (BA;US)
Spin
Spin excitations in ^{208}Pb, 11:30923 (BA;US)

LEAD ALLOYS
See also LEAD BASE ALLOYS
Corrosive Effects
Corrosion of type 316 stainless steel and 12 Cr-1 MoVW steel in flowing Pb-17 at. % Li, 11:31038 (RA;US)
Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Fluid-Structure Interactions
Safety considerations of lithium lead alloy as a fusion reactor breeding material, 11:31239 (J;US)

LEAD BASE ALLOYS
Neutron Flux
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)
Radioactivation
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)

LEAD METHOD
See ISOTOPE DATING

LEAD SELENIDES
Optical Properties
Enhanced photoredox chemistry in quantized semiconductor colloids, 11:30289 (J;US)

LEAD-ACID BATTERIES
Charges
Innovative on-board instrumentation for EV battery characterization, 11:30055 (RA;US)
Design
Multiple constant power discharge tester, 11:29897 (RA;US)
Electrical Faults
Fundamental studies of utility requirement for secondary batteries - lead-acid batteries, 11:29673 (RA;US)
Electrodes
Post-test analyses of Na/S cells and aqueous batteries, 11:29898 (RA;US)
Maintenance
Battery monitoring and integrity testing of large lead-acid storage batteries, 11:29895 (RA;US)
Performance
Fundamental studies of utility requirement for secondary batteries - lead-acid batteries, 11:29673 (RA;US)
Quality test of lead accumulators, especially of maintenance-free, sealed lead batteries with immobilized electrolyte, 11:29891 (RA;US)
Rebirth of the lead-acid battery - meeting the electric vehicle challenges of the 1980s, 11:30066 (BA;GB)
Performance Testing
Accelerated life cycle test advanced lead-acid cells at elevated temperature, 11:29943 (RA;US)
Battery storage test facility for load frequency control and instantaneous reserve, 11:29672 (RA;US)

Design, electric vehicle simulation program and duty cycle for a computer controlled bench test of lead-acid batteries, 11:30057 (RA;US)
Innovative on-board instrumentation for EV battery characterization, 11:30055 (RA;US)
Multiple constant power discharge tester, 11:29897 (RA;US)
Overview of Australian lead/acid battery test programs, 11:29879 (RA;US)
Overview of battery testing in the UK, 11:29882 (RA;US)
Performance testing of advanced lead-acid batteries for electric vehicles, 11:30053 (RA;US)
Test and data reduction algorithm for the evaluation of lead-acid battery packs, 11:30052 (RA;US)
Testing of batteries in Germany, 11:29881 (RA;US)
Technology Assessment
Rebirth of the lead-acid battery - meeting the electric vehicle challenges of the 1980s, 11:30066 (BA;GB)
Testing
Battery monitoring and integrity testing of large lead-acid storage batteries, 11:29895 (RA;US)

LEASING
Government Policies
Economic assessment of effects of royalties, severance taxes, and diligent development requirements on coal production, prices, and consumer costs. Draft final report, 11:29228 (R;US)

LEAVES
Histology
Effects of quantum flux density of photosynthesis and chloroplast ultrastructure in tissue-cultured plantlets and seedlings of Liquidambar styraciflua L. towards improved acclimatization and field survival, 11:30679 (J;US)
Physiology
Relationship between stress-induced ABA and proline accumulations and ABA-induced proline accumulation in excised barley leaves, 11:30675 (J;US)

LEP STORAGE RINGS
European Large Electron-Positron storage rings.
Fastbus System
The FASTBUS Segment Extension as a crate coupling concept, 11:30463 (J;US)
Particle Identification
Some aspects of the physics at LEP with the Delphi detector, 11:30873 (R;FR)
Research Programs
Some aspects of the physics at LEP with the Delphi detector, 11:30873 (R;FR)

LEPTON-DEUTERON INTERACTIONS
See DEUTERIUM TARGET

LEPTONS
See also HEAVY LEPTONS
NEUTRINOS
Mass Formulae
Mass hierarchies of quarks and leptons in a supersymmetric SP(2N) subcolor theory, 11:30864 (R;JP)
Particle Identification
How to search for new particles at anti pp colliders, 11:30847 (BA;US)
Particle Structure
New particle searches at e^+e machines, 11:30838 (R;FR)

LEUCINE
Chemical Preparation
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)

LIBRARIES
On-Line Systems
Computing Services Software Library, 11:31293 (R;US)

LICHENS
Comparative Evaluations
Retention of simulated fallout particles by lichens and mosses, 11:30587 (J;US)

LI-DRIFTED SI DETECTORS
Fabrication
300-element silicon-lithium position-sensitive imaging detector for angiography, 11:30430 (J;US)
Performance
300-element silicon-lithium position-sensitive imaging detector for angiography, 11:30430 (J;US)

LIGHT
See VISIBLE RADIATION

LIGHTING SYSTEMS
Design
Improvement of the energy economy of industrial lightning, 11:30025 (R;FI;In Finnish)
Energy Conservation
Improvement of the energy economy of industrial lightning, 11:30025 (R;FI;In Finnish)

LIGNITE
Ash Content
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Biodegradation
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Chemical Composition
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Production
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Sulfur Content
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)

LIMESTONE
Corrosion
Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)
Weathering
Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)

LIMITERS
See also PUMPED LIMITERS
Comparative Evaluations
Impact of a poloidal divertor in ignition tokamak design, 11:31186 (J;US)
Cooling Systems
Evaluation of cooling channel configurations for actively cooled limiters, 11:31081 (R;US)
Performance
Sputtering performance of a pumped limiter for an ignition tokamak, 11:31090 (J;US)

LINERS
Metallography
Metallographic examination of EPICOR-II liners from Three Mile Island, 11:29362 (RA;US)

LIPOPROTEINS
Receptors
Effect of preferential insertion of LDL receptors near coated pits, 11:30636 (J;US)

LIQUEFIED GASES
See also LIQUEFIED PETROLEUM GASES
Leaks
Liquid to gas leak ratios with liquid nitrogen and liquid helium, 11:31190 (J;US)

LIQUEFIED PETROLEUM GASES
Hazards
Liquefied gases risk assessment. Part 1: LPG land transportation and storage safety. Part 2: Potential hazards of low-temperature LPG in contact with warmer liquids, e.g. water, 11:29243 (R;DE;In German)

LIQUID ASPHALT
See PETROLEUM RESIDUES

LIQUID COLUMN CHROMATOGRAPHY
Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985, 11:29183 (R;US)
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)

LIQUID CRYSTALS
Nuclear Magnetic Resonance
Proton and deuterium NMR experiments in zero field, 11:30814 (R;US)
LIQUID EFFLUENTS
See LIQUID WASTES
LIQUID METAL COOLANT
See LIQUID METALS
LIQUID METAL COOLED REACTORS
See also LMFBR TYPE REACTORS
Fuel Assemblies
Mechanically attached load pad for liquid metal nuclear reactor fuel assemblies, 11:29782 (P;US)
LIQUID METAL TEST FACILITIES
See TEST FACILITIES
LIQUID METALS
Control
MHD flow control as a design approach for self-cooled liquid-metal blankets of magnetic confinement fusion reactors, 11:31112 (J;US)
Corrosive Effects
Liquid-metal corrosion, 11:31098 (J;US)
Ion Emission
Liquid metal field emission thrusters and ion sources: a review. Final report, 11:30032 (R;GB)
Liquid Flow
MHD flow control as a design approach for self-cooled liquid-metal blankets of magnetic confinement fusion reactors, 11:31112 (J;US)
Magnetohydrodynamics
Experimental facility for studying MHD effects in liquid metal cooled blankets, 11:31110 (J;US)
Magnetohydrodynamic considerations for the design of self-cooled liquid-metal fusion reactor blankets, 11:31111 (J;US)
MHD flow control as a design approach for self-cooled liquid-metal blankets of magnetic confinement fusion reactors, 11:31112 (J;US)
LIQUID WASTES
See also SPENT LIQUORS
WASTE WATER
Minimization
Liquid radwaste minimization efforts at Duke Power Company, 11:29367 (RA;US)
LIQUIDS
See also COAL LIQUIDS
LIQUID CRYSTALS
LIQUID METALS
Fragmentation
Fragmentation of suddenly heated liquids in ICF reactors, 11:31189 (J;US)
Heating
Fragmentation of suddenly heated liquids in ICF reactors, 11:31189 (J;US)
LITEK LAMP
See FLUORESCENT LAMPS
LITHIUM
Breeding Ratio
Measuring nanocurie quantities of tritium bred in metallic lithium and lithium oxide samples, 11:31204 (J;US)
Corrosive Effects
Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium, 11:31037 (RA;US)
Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Environmental effects on properties of structural alloys in flowing lithium, 11:31039 (RA;US)
Crystal Doping
Electron spin echo studies of donor-doped poly(p-phenylene) and its oligomers, 11:30272 (J;GB)
Materials Testing
Measuring nanocurie quantities of tritium bred in metallic lithium and lithium oxide samples, 11:31204 (J;US)
LITHIUM 6 BEAMS
Beam Production
An alpha particle diagnostic beam line system to generate an intense Li^{0} beam with an ORNL SITEX source, 11:31200 (J;US)
LITHIUM 6 TARGET
Neutron Reactions
Evaluation of neutron nuclear data of ^{6}Li for JENDL-3, 11:30901 (R;JP)
Photoproduction
Search of prompt electrons in the NA14 photoproduction experiment at the CERN, 11:30836 (R;FR;In French)
LITHIUM 7 TARGET
Neutron Reactions
Evaluation of neutron nuclear data of ^{7}Li for JENDL-3, 11:30902 (R;JP)
Neutron nuclear data of ^{7}Ni adopted in JENDL-2, 11:30899 (R;JP)
LITHIUM ALLOYS
Corrosive Effects
Corrosion of type 316 stainless steel and 12 Cr-1 MoVW steel in flowing Pb-17 at. % Li, 11:31038 (RA;US)
Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Fluid-Structure Interactions
Safety considerations of lithium lead alloy as a fusion reactor breeding material, 11:31239 (J;US)
Materials Testing
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
Neutron Flux
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)
Physical Radiation Effects
Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
Radioactivation
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)
LITHIUM BROMIDES
Thermodynamic Properties
Thermodynamic properties state equations of pure methanol and methanol-LiBr . $ZnBr_2$ solutions used in vapor absorption refrigeration and air-conditioning cycle, 11:29595 (RA;US)
LITHIUM COMPLEXES
Comparative Evaluations
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
Molecular Structure
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
Surface Properties
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
LITHIUM COMPOUNDS
See also LITHIUM OXIDES
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
LITHIUM OXIDES
Breeding Ratio
Measuring nanocurie quantities of tritium bred in metallic lithium and lithium oxide samples, 11:31204 (J;US)
Thermochemical comparison of the effectiveness of protium purging of fusion breeders, 11:31142 (J;US)
Chemical Reactions
Compatibility of Li_2O in a flowing helium environment, 11:31040 (RA;US)

Materials Testing
Measuring nanocurie quantities of tritium bred in metallic lithium and lithium oxide samples, 11:31204 (J;US)
Mechanical Properties
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Physical Radiation Effects
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Porosity
Tritium breeding material : *o* $LiAlO_2$, 11:31160 (J;US)
Reviews
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Thermal Conductivity
Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiAlO_2$ solid breeders with and without irradiation effects, 11:31255 (J;US)

LITHIUM-SULFUR BATTERIES
Performance Testing
Advanced secondary battery development and testing: a Canadian perspective, 11:29880 (RA;US)

LIXIVIATION
See LEACHING

LMFBR TYPE REACTORS
Alloy Nuclear Fuels
Gas-bubble growth mechanisms in the analysis of metal fuel swelling, 11:30082 (R;US)
Fire Hazards
Local transport of vertically- and horizontally-emitted sodium oxide aerosols, 11:29778 (R;US)
Primary Coolant Circuits
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
Reactor Components
Elasto-plastic benchmark calculations. Step 1: verification of the numerical accuracy of the computer programs, 11:31278 (R;FR)
Reactor Operation
Model for LMFBR core transient analysis in real-time, 11:29779 (R;US)
Steam Generators
Ten years of sodium cooled steam generator tests on the C.G.V.S. Synthesis of the results obtained on these equipments and operation experiments of an industrial size test facility, 11:29780 (R;FR;In French)

LOCA
See LOSS OF COOLANT

LOCAL GALAXY
See MILKY WAY

LOCAL GOVERNMENT
Taxes
Local economic impacts associated with pure taxable capacity changes, 11:29790 (J;US)
Local taxation and the consequences of revenue distribution patterns, 11:30622 (J;NL)

LOCAL GROUP
See GALAXIES

LOFT REACTOR
Reactor Operation
Influence of LOFT PWR transient simulations on thermal-hydraulic aspects of commercial PWR safety, 11:29869 (J;US)
Research Programs
Influence of LOFT PWR transient simulations on thermal-hydraulic aspects of commercial PWR safety, 11:29869 (J;US)

LONG VALLEY
Calderas
Workshop on hydrologic and geochemical monitoring in the Long Valley Caldera: proceedings, 11:30747 (R;US)

LONG-LENS SPECTROMETERS
See MAGNETIC LENS SPECTROMETERS

LOS ALAMOS
Radioactive Waste Management
Distribution of plutonium and americium beneath a 33-year-old liquid waste disposal site, 11:30618 (J;US)

LOSS OF COOLANT
Computerized Simulation
Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Core Flooding Systems
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Heat Transfer
Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility, 11:29844 (R;US)
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Heat transfer to a dispersed two phase flow and detailed quench front velocity research, 11:29836 (R;FR)
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Study of two-dimensional effects in the core of a light water reactor during the ECC'S phase following a loss of coolant accident, 11:29837 (R;FR)
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Hydraulics
Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility, 11:29844 (R;US)
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Study of two-dimensional effects in the core of a light water reactor during the ECC'S phase following a loss of coolant accident, 11:29837 (R;FR)
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Rewetting
Heat transfer to a dispersed two phase flow and detailed quench front velocity research, 11:29836 (R;FR)
Study of rewetting and quench phenomena by single pin out-of-pile experiments, with special emphasis on the effect of pin composition, 11:30379 (R;FR)
Test Facilities
Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility, 11:29844 (R;US)

LOSS OF FLUID TEST REACTOR
See LOFT REACTOR

LOWER HYBRID HEATING
Efficiency
Top-versus-side launch of lower hybrid waves in PLT, 11:30990 (J;AT)
Harmonics
Mode conversion of lower hybrid waves at high ion cyclotron harmonics. Appendix F, 11:30963 (R;US)
Numerical Solution
Numerical modeling of lower hybrid heating and current drive, 11:30979 (R;US)

LOWER HYBRID RESONANCE HEATING
See LOWER HYBRID HEATING

LOW-LEVEL RADIOACTIVE WASTES
Combustion
Commercial regional incinerator facility for treatment of low-level radioactive waste, 11:29385 (RA;US)
Comparison between mobile VR services and central VR service facility for dry active waste, 11:29386 (RA;US)
Mobile incineration services at Commonwealth Edison's nuclear stations, 11:29381 (RA;US)
Compacting
Comparison between mobile VR services and central VR service facility for dry active waste, 11:29386 (RA;US)
DAW volume reduction (VR) using the newly developed 20 MN (2200 tons) SUPERPACK: a new generation of supercompactor equipment, 11:29382 (RA;US)

Operating experience of a mobile waste shredding system, 11:29347 (RA;US)
Operating experience with a dry active waste shredder/compactor at a nuclear power plant, 11:29384 (RA;US)
Volume reduction of dry active waste: the mobile service option, 11:29383 (RA;US)

Containers
Experiences in development, qualification, and use of concrete high-integrity containers in commercial disposal of radioactive wastes, 11:29359 (RA;US)

Decontamination
Recycle operations as a methodology for radioactive waste volume reduction, 11:29344 (RA;US)

Evaporation
Operational experience of the Palisades volume reduction system: the first 12 months, 11:29387 (RA;US)

Fluidized-Bed Combustion
Aeroject fluidized bed volume reduction system operation and licensing, 11:29390 (RA;US)

Geochemistry
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)

Ground Disposal
Remedial waste management practices resulting in the decline of airborne plutonium adjacent to a liquid waste disposal ditch at the Hanford site, 11:29435 (RA;US)
Subsurface moisture regimes and tracer movement under two types of trench-cap designs for shallow land burial sites, 11:29403 (R;US)
Technology development for the design of waste repositories at arid sites: field studies of biointrusion and capillary barriers, 11:29404 (R;US)

Grouting
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)

Marine Disposal
Comparison of land and ocean disposal alternatives for bulk wastes containing naturally occurring radionuclides, 11:29339 (RA;US)

Meetings
Proceedings of the seventh annual participants' information meeting. DOE Low-Level Waste Management Program, 11:29399 (R;US)
Waste Management '85: Waste Isolation in the US - Technical Programs and Public Education. Volume 2. Waste policies and programs, low-level waste, 11:29317 (R;US)

Minimization
Solid waste minimization at Duke Power Company, 11:29366 (RA;US)

Nuclear Waste Policy Acts
Public Law 99-240: an act to amend the low-Level Radioactive Waste Policy Amendments Act of 1985. Introduced in the Senate and House of Representatives of the United States of America in Congress assembled, Ninety-Ninth Congress, January 15, 1986, 11:29419 (B;US)

Packaging
Integration of interim storage and the permanent disposal of low-level radioactive waste, 11:29336 (RA;US)

Pelletizing
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)

Political Aspects
Institutional and technical issues in the management of low-level mixed wastes, 11:29329 (RA;US)

Quantitative Chemical Analysis
Analytical techniques for the in-situ quantification of low-level waste, 11:30177 (RA;US)

Radioactive Waste Disposal
California's response to the Low-Level Radioactive Waste Policy Act of 1980: policy and progress, 11:29321 (RA;US)
Development of the Central Waste Disposal Facility, 11:29341 (RA;US)
Estimating waste disposal quantities from raw waste samples, 11:29395 (RA;US)
Fifteen years of radioactive waste management at Ontario Hydro, 11:29372 (RA;US)
Geology of the host formation for the new hydraulic fracturing facility at Oak Ridge National Laboratory, 11:29375 (RA;US)
Integration of interim storage and the permanent disposal of low-level radioactive waste, 11:29336 (RA;US)
Monitoring of surface deformation and microseismicity applied to radioactive waste disposal through hydraulic fracturing at Oak Ridge National Laboratory, 11:29376 (RA;US)
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)
Penn State continuing education program on low-level radioactive waste disposal and management: lessons learned, 11:29318 (RA;US)
Recent hydrofracture operations at Oak Ridge National Laboratory, 11:29374 (RA;US)
Regulatory framework for hazardous mixed wastes, 11:29328 (RA;US)
Selection and evaluation of potential very low level wastes (VLLW) from nuclear power plants, 11:29364 (RA;US)
Texas goes it alone: political and legal considerations, 11:29320 (RA;US)
Through the regulatory hoop, 11:29322 (RA;US)
Transition from storage to permanent disposal of low- and intermediate-level wastes at the Chalk River Nuclear Laboratories, 11:29324 (RA;US)

Radioactive Waste Facilities
Comparison of low-level radioactive waste management alternatives, 11:29335 (RA;US)
Local government participation in the siting of a low-level radioactive waste disposal facility: the Texas experience, 11:29319 (RA;US)
Low-level volume reduction services facility, 11:29348 (RA;US)

Radioactive Waste Management
Institutional and technical issues in the management of low-level mixed wastes, 11:29329 (RA;US)
Proceedings of the seventh annual participants' information meeting. DOE Low-Level Waste Management Program, 11:29399 (R;US)
Strategy and need: DOE's hazardous waste program, 11:29333 (RA;US)
Waste Management '85: Waste Isolation in the US - Technical Programs and Public Education. Volume 2. Waste policies and programs, low-level waste, 11:29317 (R;US)

Radioactive Waste Processing
Advanced cement solidification process, 11:29352 (RA;US)
Comparison between mobile VR services and central VR service facility for dry active waste, 11:29386 (RA;US)
DAW volume reduction (VR) using the newly developed 20 MN (2200 tons) SUPERPACK: a new generation of supercompactor equipment, 11:29382 (RA;US)
Durasil ion exchangers: experience at Arkansas Nuclear One, 11:29351 (RA;US)
Fifteen years of radioactive waste management at Ontario Hydro, 11:29372 (RA;US)
Liquid radwaste processing, operational experience utilizing Duratek Mobile Process System (MPS), 11:29391 (RA;US)
Mobile liquid VR system: a cost effective alternative, 11:29349 (RA;US)
Operating experience with a dry active waste shredder/compactor at a nuclear power plant, 11:29384 (RA;US)
Operational experiences of non-precoated type filters (super fine filter) in PWR and BWR nuclear power plants, 11:29812 (RA;US)
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)
Radwaste ion-exchange optimization, 11:29392 (RA;US)
SETH 200: new mobile unit for spent ion-exchange resins embedding in polymers, 11:29343 (RA;US)
Stabilizing solidification I: a method of immobilization of radioactive waste involving volume reduction, 11:29345 (RA;US)

Testing and operation of a transportable volume reduction unit, 11:29363 (RA;US)
Transport, installation, and testing of a transportable volume reduction and bitumen solidification system, 11:29388 (RA;US)
Vitrokele compositions: novel, high affinity, metal selective and regenerable media for the removal of radioactive metals from aqueous nuclear waste streams, 11:29357 (RA;US)
Volume reduction through dry active waste segregation, 11:29350 (RA;US)
Volume reduction of dry active waste: the mobile service option, 11:29383 (RA;US)
Radioactive Waste Storage
Extended storage of low-level radioactive waste: potential problem areas, 11:30079 (RA;US)
Modification of an existing radwaste facility to provide onsite low level waste storage, 11:29368 (RA;US)
Radioactivity
Segregation of low-level dry active waste, 11:29365 (RA;US)
Radiochemical Analysis
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)
Regulations
Through the regulatory hoop, 11:29322 (RA;US)
Sampling
Solving sampling problems, 11:29371 (RA;US)
Solidification
Advanced cement solidification process, 11:29352 (RA;US)
Cementation of radioactive wastes in the Federal Republic of Germany, 11:29377 (RA;US)
Design, manufacturing and commissioning of mobile unit for EDF (Dow Chemical process), 11:29358 (RA;US)
Design of a modular radwaste facility, 11:29355 (RA;US)
Industrial demonstration plant for granulation of simulated radioactive and toxic wastes, 11:29356 (RA;US)
Operational and long-term performance assessment for Hanford grout, 11:29379 (RA;US)
Operational experience of the Palisades volume reduction system: the first 12 months, 11:29387 (RA;US)
Overview of the applications of cement-based immobilization technologies developed at US DOE facilities, 11:29373 (RA;US)
Recent experiences with cement solidification systems, 11:29378 (RA;US)
Stabilizing solidification II: fundamental test of the waste solidification process utilizing hydrothermal reaction, 11:29346 (RA;US)
Transport, installation, and testing of a transportable volume reduction and bitumen solidification system, 11:29388 (RA;US)
Underground Disposal
Application of organic tracers in characterizing the Greater Confinement Disposal Test at the Nevada Test Site, 11:29340 (RA;US)
Comparison of land and ocean disposal alternatives for bulk wastes containing naturally occurring radionuclides, 11:29339 (RA;US)
Considerations for creating a free-standing monolith, 11:29338 (RA;US)
Greater-confinement disposal of radioactive wastes, 11:29337 (RA;US)
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)
Modularized system for disposal of low-level radioactive waste, 11:29342 (RA;US)
Segregation of low-level dry active waste, 11:29365 (RA;US)
Subsidence and settlement and their effect on shallow land burial, 11:29326 (RA;US)
Volume
Estimating waste disposal quantities from raw waste samples, 11:29395 (RA;US)
Water Removal
Dewatering of bean and powdered resin at Three Mile Island Unit 1, 11:29370 (RA;US)
Radwaste drying: an engineered system for powdered and granular media, 11:29353 (RA;US)

LP-GAS
See LIQUEFIED PETROLEUM GASES
LUMBER INDUSTRY
See WOOD PRODUCTS INDUSTRY
LUNGS
Edema
A new Compton densitometer for measuring pulmonary edema, 11:30665 (J;US)
LUXEMBOURG
Energy Policy
Luxembourg - energy situation 1984, 11:29927 (R;DE;In German)
Energy Supplies
Luxembourg - energy situation 1984, 11:29927 (R;DE;In German)
LWBR TYPE REACTORS
Fuel Rods
Fabrication and loading of fuel rods for the Light Water Breeder Reactor (LWBR Development Program), 11:29781 (R;US)
LYASES
Code number 4
Radioimmunoassay
Pyruvate, Pi dikinase in bundle sheath strands as well as in mesophyll cells in maize leaves, 11:30669 (J;US)
LYMPHOCYTES
Bioassay
Use of cytogenetic endpoints in human lymphocytes as indicators of exposure to genotoxicants, 11:30721 (BA;US)
DNA Repair
DNA repair in PHA stimulated human lymphocytes, 11:30691 (R;IT;In Italian)
LYMPHOID CELLS
See LYMPHOCYTES

M

M CODES
MVUSRS utility reference manual, 11:31287 (R;US)
MA 754
See NICKEL BASE ALLOYS
MA 956
See IRON BASE ALLOYS
MACERALS
Infrared Spectra
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986 (Resinite), 11:29204 (R;US)
Separation Processes
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
MACROPHAGES
Cell Flow Systems
Characterization of subsets of bone marrow-derived macrophages by flow cytometry analysis, 11:30646 (J;US)
MAGMAMAX PROCESS
See BINARY-FLUID SYSTEMS
MAGNESIUM
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Separation Processes
Eluent and ligand effects in cation chromatography, 11:30185 (D;US)

MAGNESIUM 26 TARGET
Oxygen 18 Reactions
Study of some direct reactions at 0° in $^{18}O + ^{26}Mg$ and $^{18}O + ^{13}C$ systems, 11:30897 (R;FR;In French)
MAGNESIUM OXIDES
See also SPINELS
Crack Propagation
Subcritical crack growth in partially stabilized $ZrO_2(MgO)$, 11:30125 (J;GB)
Electrochemical Corrosion
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Fracture Properties
Fracture toughness of $MgCr_2O_4$-ZrO_2 composities, 11:30133 (BA;US)
Physical Radiation Effects
Nuclear responses in INTOR plasma stabilization elements, 11:31135 (J;US)
Temperature Effects
Nuclear responses in INTOR plasma stabilization elements, 11:31135 (J;US)
MAGNET COILS
Electric Potential
Transient voltage oscillations in coils, 11:31185 (J;US)
Electrical Transients
Transient voltage oscillations in coils, 11:31185 (J;US)
Hot Spots
Hot spots in the inboard section of the TFCX toroidal field coils, 11:31183 (J;US)
Physical Radiation Effects
Hot spots in the inboard section of the TFCX toroidal field coils, 11:31183 (J;US)
Removal
A demountable toroidal field coil system for a commercial tokamak reactor, 11:31172 (J;US)
MAGNET POLE PIECES
Magnetic Fields
Permanent magnet multipole with adjustable strength, 11:30357 (P;US)
MAGNETIC COILS
See MAGNET COILS
MAGNETIC DIPOLES
Magnetic Fields
Permanent magnet multipole with adjustable strength, 11:30357 (P;US)
MAGNETIC FIELD CONFIGURATIONS
For pinch configurations, use the narrower terms of PINCH EFFECT.
See also MAGNETIC FIELD RIPPLES
MAGNETIC SURFACES
Asymmetry
Assessment of magnetic field asymmetries in ELMO Bumpy Square, 11:31181 (J;US)
MAGNETIC FIELD RIPPLES
Corrections
Magnetic ripple correction in tandem mirrors by ferromagnetic inserts, 11:31182 (J;US)
MAGNETIC FIELDS
Alignment
Magnet alignment in MFTF-B, 11:31261 (BA;US)
Biological Effects
Biological effects of stationary magnetic fields, 11:30733 (BA;US)
Mechanisms for biological effects of magnetic fields, 11:30734 (BA;US)
Interactions
Mechanisms for biological effects of magnetic fields, 11:30734 (BA;US)
Nuclear Magnetic Resonance
Mechanisms for biological effects of magnetic fields, 11:30734 (BA;US)
Zeeman Effect
Mechanisms for biological effects of magnetic fields, 11:30734 (BA;US)
MAGNETIC LENS SPECTROMETERS
Drift Chambers
New focal plane detector for the magnet spectrometer Big Karl, 11:30480 (J;NL)
MAGNETIC MIRROR TYPE REACTORS
See also MARS REACTOR
TMR REACTORS
Demonstration Programs
Tritium system design for the mirror reactors FPD-I, FPD-II, and FPD-III, 11:31203 (J;US)
Design
Tritium system design for the mirror reactors FPD-I, FPD-II, and FPD-III, 11:31203 (J;US)
MAGNETIC MIRRORS
Including systems with minimum-B configuration.
See also ELMO DEVICES
MFTF DEVICES
TANDEM MIRRORS
Octupolar Configurations
Octopole design concepts for the mirror end cell, 11:31184 (J;US)
MAGNETIC MOMENTS
Inhibition
Phenomena involving magnetic moment suppression, 11:30953 (BA;US)
MAGNETIC MONOPOLES
Simple picture of Rubakov-Callan effects, 11:30866 (RA;JP)
Abundance
Astrophysical constraints on the monopole abundance, 11:30782 (RA;JP)
Annihilation
Monopole annihilations and the knee in cosmic ray data, 11:30829 (RA;JP)
Lagrangian Field Theory
Constrained Lagrangian theory for monopoles, 11:30886 (R;GB)
Particle Identification
Underground searches for anomalous penetrating particles, 11:30835 (RA;JP)
Particle Interactions
Issues in monopole-catalyzed proton decay, 11:30870 (RA;JP)
MAGNETIC REFRIGERATORS
Design
Experiment to determine properties of packed particle beds and regenerators at cryogenic temperatures, 11:30360 (J;US)
MAGNETIC SURFACES
Numerical Solution
Numerical determination of the magnetic field line Hamiltonian, 11:31079 (R;US)
MAGNETIZATION
Ising Model
Canonical ensemble redefined - 2: Magnetic systems, 11:30957 (R;XA)
MAGNETOHYDRODYNAMIC GENERATORS
See MHD GENERATORS
MAGNETOSPHERE
See EARTH MAGNETOSPHERE
MAHOGANY TREES
See TREES
MAHOGANY ZONE
Geochemical Surveys
Oil shale grade variability in close-spaced core holes in the Mahogany zone of the Colony Shale Oil Project area, 11:29257 (BA;US)
Oil Shale Deposits
Oil shale grade variability in close-spaced core holes in the Mahogany zone of the Colony Shale Oil Project area, 11:29257 (BA;US)
MAINTENANCE
See also REACTOR MAINTENANCE
Cost Benefit Analysis
A comparison of all-remote and personnel access maintenance operations for INTOR, 11:31131 (J;US)
MAIZE
Biological Pathways
Pyruvate, Pi dikinase in bundle sheath strands as well as in mesophyll cells in maize leaves, 11:30669 (J;US)
Enzyme Activity
Pyruvate decarboxylase from Zea mays L., 11:30628 (J;US)

Sterility
Episomal DNA as a molecular probe of cytoplasmic male sterility in S Zea mays, 11:30650 (BA;US)
MALAYA
See MALAYSIA
MALAYSIA
Energy Supplies
Malaysia - energy situation 1984, 11:29924 (R;DE;In German)
Imports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
MALIC ACID
Biosynthesis
Temperature dependence of carbon isotope fractionation in CAM plants, 11:30677 (J;US)
MALIGNANCIES
See NEOPLASMS
MAN
All of mankind, of any age or of either sex.
Dose Rates
Calculation of dose rates from critical radionuclides in low-level radioactive waste disposal, 11:29444 (RA;US)
Radiation Doses
Relevance of biotic pathways to the long-term regulation of nuclear waste disposal. Estimation of radiation dose to man resulting from biotic transport: the BIOPORT/MAXI1 software package. Volume 5, 11:29446 (R;US)
Use of the food-chain model FOOD III and the soil model SCEMR to assess irrigation as a biosphere pathway, 11:30579 (R;CA)
MANGANESE
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Ecological Concentration
Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States, 11:30524 (R;US)
Electrochemistry
Manganese, technetium, and rhenium, 11:30221 (BA;US)
Thermodynamics
Manganese, technetium, and rhenium, 11:30221 (BA;US)
Uptake
Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
MANGANESE 54
Diffusion
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
MANGANESE ALLOYS
Corrosion
Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium, 11:31037 (RA;US)
Hydridation
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)
MANGANESE COMPLEXES
Curie Point
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Ferrimagnetism
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Magnetic Susceptibility
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
Phase Transformations
Ferrimagnetism in $MnFeF_5.2H_2O$, 11:30219 (J;US)
MANITOBA
Geologic Surveys
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
MANUFACTURING
Energy Consumption
1975, 1976 Energy Consumption Data Base for the Industrial Sector. Volume 3. Computer-related documentation. Final report, 11:29948 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
MANUFACTURING FACILITIES
See INDUSTRIAL PLANTS
MANY-DIMENSIONAL CALCULATIONS
More than four dimensions.
Compactification
Stable compactifications, 11:30880 (R;US)
MAPLES
Biological Pathways
Stable-carbon isotopic composition of maple sap and foliage, 11:30631 (J;US)
Isotope Ratio
Stable-carbon isotopic composition of maple sap and foliage, 11:30631 (J;US)
MAR-250 ALLOY
See MARAGING STEELS
MARAGING STEELS
Heat Treatments
Maraging superalloys and heat treatment processes, 11:30107 (P;US)
Microstructure
Maraging superalloys and heat treatment processes, 11:30107 (P;US)
MARBLE
Corrosion
Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)
Weathering
Roughening, recession, and chemical alteration of marble and limestone sample surfaces during atmospheric exposure in the eastern United States, 11:30526 (R;US)
MARINE DISPOSAL
Comparative Evaluations
Comparison of land and ocean disposal alternatives for bulk wastes containing naturally occurring radionuclides, 11:29339 (RA;US)
MARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
MARINE VEHICLE ACCIDENTS
See ACCIDENTS
MARS REACTOR
Breeding Blankets
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)
Demonstration Programs
Overview of the Fusion Power Demonstration study, 11:31129 (J;US)
Design
Overview of the Fusion Power Demonstration study, 11:31129 (J;US)
Magnetic Fields
Physics-magnetics trade studies for tandem mirror reactors, 11:30997 (J;US)
Net Energy
Physics-magnetics trade studies for tandem mirror reactors, 11:30997 (J;US)
Radiation Streaming
End cell shielding and streaming analysis of MARS tandem mirror reactor, 11:31147 (J;US)
Shielding
End cell shielding and streaming analysis of MARS tandem mirror reactor, 11:31147 (J;US)
MASKS
See RESPIRATORS
MASS SPECTROSCOPY
Very High Temperature
High temperature mass spectrometry study on fast-neutrons-nuclear-reactor irradiated fuel, 11:29806 (R;FR)
MASSACHUSETTS
Radioactive Waste Facilities
Massachusetts Crystalline Repository Project. Progress report, December 31, 1985, 11:29400 (R;US)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY ALC
See ALCATOR DEVICE
MASURIUM
See TECHNETIUM
MATERIALS
See also BUILDING MATERIALS
COMPOSITE MATERIALS
DIELECTRIC MATERIALS
DOPED MATERIALS
GRANULAR MATERIALS
HAZARDOUS MATERIALS
PHASE CHANGE MATERIALS
PHOTOCHROMIC MATERIALS
RADIOACTIVE MATERIALS
REACTOR MATERIALS
REINFORCED MATERIALS
SEALING MATERIALS
SEMICONDUCTOR MATERIALS
SHIELDING MATERIALS
THERMONUCLEAR REACTOR MATERIALS
Performance Testing
Advanced materials for geothermal energy processes, 11:29630 (RA;US)
Research Programs
Chemistry research resource. Progress report, March 1986, 11:30175 (R;US)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
MATERIALS (BUILDING)
See BUILDING MATERIALS
MATERIALS (COMPOSITE)
See COMPOSITE MATERIALS
MATERIALS (DIELECTRIC)
See DIELECTRIC MATERIALS
MATERIALS (DOPED)
See DOPED MATERIALS
MATERIALS HANDLING EQUIPMENT
See also CRANES
REMOTE HANDLING EQUIPMENT
SHREDDERS
Design
Dump assembly, 11:30356 (P;US)
MATERIALS (REINFORCED)
See REINFORCED MATERIALS
MATERIALS (SEMICONDUCTOR)
See SEMICONDUCTOR MATERIALS
MATERIALS (SHIELDING)
See SHIELDING MATERIALS
MATERIALS TESTING
Scientific basis for Nuclear Waste Management VIII, 11:29428 (B;US)
Research Programs
Research directions in solid dynamics, 11:30387 (R;US)
Shock Waves
Technique for megabar controlled strain experiments, 11:30098 (R;US)
Test Facilities
SNLL materials testing compression facility, 11:30389 (R;US)
MATERIALS TESTING REACTORS
For testing properties of materials or equipment in a radioactive environment.
See also ATR REACTOR
HECTOR REACTOR
HFR REACTOR
Technology Utilization
Utilization of fission reactors for fusion engineering testing, 11:31247 (J;US)
MATHEMATICAL MODELS
See also CLIMATE MODELS
COSMOLOGICAL MODELS
PARTICLE MODELS
STATISTICAL MODELS
Data Covariances
Dry deposition model sensitivity, 11:30561 (RA;US)
Performance Testing
Lidar observations of mixed layer dynamics: tests of parameterized entrainment models of mixed layer growth rate, 11:30523 (J;US)
MATRICES
Numerical Solution
Constructive characterization of Q_0-matrices with nonnegative principal minors, 11:30961 (R;US)
MATTER
Stability
Stability of matter, 11:30806 (R;AT;In German)
MEAT INDUSTRY
Waste Water
Anaerobic digestion of slaughter waste water, 11:29469 (RA;DE)
MECHANICAL DECLADDING
Consolidated Fuel Reprocessing Program. Progress report, October 1-December 31, 1985, 11:29296 (R;US)
MECHANICAL FILTERS
See also GRANULAR BED FILTERS
Design
Fission gas detection system, 11:29875 (P;US)
MECHANICAL STRUCTURES
Failure Mode Analysis
Solid breeder/structure mechanical interaction and thermal stability, 11:31137 (J;US)
Temperature Effects
Solid breeder/structure mechanical interaction and thermal stability, 11:31137 (J;US)
Wave Propagation
EURDYN-1D: a computer code for the one-dimensional non-linear dynamic analysis of structural systems. Description and users' manual (release 1) (Reactor structures), 11:31279 (R;FR)
MECHANICAL VIBRATIONS
Damping
Vibration damping in externally pressurized gas bearings, 11:30353 (R;US)
MEETINGS
Proceedings of the workshop on 'monopoles and proton decay', 11:30822 (R;JP)
Proceedings of the first TRISTAN phase II workshop, 11:30831 (R;JP)
MEGAKARYOCYTES
See BONE MARROW CELLS
MELANOCYTES
See ANIMAL CELLS
MEMBRANES
See also PHOTOSYNTHETIC MEMBRANES
Manufacturers
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Permeability
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Permeation of metal ions through a series of two complementary supported liquid membranes, 11:30187 (J;NL)
MERCAPTOALANINE-BETA
See CYSTEINE
MERCURY
Glow Discharges
Magnetic fluorescent lamp having reduced ultraviolet self absorption, 11:30402 (P;US)
MERCURY COMPOUNDS
See also MERCURY SELENIDES
Detection
Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system, 11:30224 (J;GB)
MERCURY SELENIDES
Optical Properties
Enhanced photoredox chemistry in quantized semiconductor colloids, 11:30289 (J;US)
MESON RESONANCES
Particle Production
DM2 results on hadronic and radiactive J/psi decays, 11:30837 (R;FR)
MESON-DEUTERON INTERACTIONS
See DEUTERIUM TARGET
METAGALAXY
See UNIVERSE

METAL INDUSTRY
Contamination
Auburn Steel Company radioactive contamination incident, 11:29408 (R;US)
Energy Consumption
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report, 11:29980 (R;US)
METAL VAPOR LASERS
Computer-Aided Design
Soft X-ray source based on a low divergence, high repetition rate ultraviolet laser, 11:30371 (BA;US)
Pumping
Photoionization lasers pumped by broadband soft-X-ray radiation from laser-produced plasmas, 11:30372 (BA;US)
Theoretical studies of resonance enhance stimulated raman scattering (RESRS) of frequency doubled Alexandrite laser wavelengths in cesium vapor. Semiannual report, 11:30364 (R;US)
Ultraviolet Radiation
Photoionization lasers pumped by broadband soft-X-ray radiation from laser-produced plasmas, 11:30372 (BA;US)
X-Ray Spectra
Experimental and simulation studies on soft-X-ray emission from 0.53 micron-laser irradiated solid targets, 11:30374 (BA;US)
METALLOTHIONEIN
Genetic Mapping
Assignment of genes encoding metallothioneins I and II to Chinese hamster chromosomes 3. Evidence for the role of chromosome rearrangement in gene amplification, 11:30724 (J;US)
METAL-NONMETAL BATTERIES
See also LITHIUM-SULFUR BATTERIES
SODIUM-SULFUR BATTERIES
ZINC-BROMINE BATTERIES
Anodes
Cell design for lithium alloy/metal sulfide battery, 11:29903 (P;US)
Cathodes
Cell design for lithium alloy/metal sulfide battery, 11:29903 (P;US)
Design
Cell design for lithium alloy/metal sulfide battery, 11:29903 (P;US)
METALS
See also ACTINIDES
ALKALI METALS
ALKALINE EARTH METALS
ALUMINIUM
ANTIMONY
BISMUTH
CADMIUM
GERMANIUM
LEAD
LIQUID METALS
MERCURY
POLONIUM
TIN
ZINC
Electrodeposited Coatings
Method of measuring metal coating adhesion, 11:30109 (P;US)
Fastening
Metal-to-ceramic attachment device, 11:30110 (P;US)
Microwave Heating
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Thermal Diffusion
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Toxicity
Cytotoxicity from coupled redox cycling of autoxidizing xenobiotics and metals: a selective critical review and commentary on work-in-progress, 11:30727 (J;IL)
METAMORPHIC ROCKS
See also GNEISSES
MARBLE
Radionuclide Migration
Scientific basis for nuclear waste management IX, 11:29420 (B;US)
METEORITES
Environmental Impacts
Impact theory of mass extinctions and the invertebrate fossil record, 11:30573 (J;US)
METHANE
Adsorption
Separation of a five-component gas mixture by pressure swing adsorption, 11:30183 (J;US)
Biosynthesis
Attempt of the biogas development and utilization. The introduction of the community biogas digesters and biogas distribution to each family in an agricultural research institute, 11:29468 (RA;DE)
Biogas technology for water pumping in Botswana, 11:29464 (RA;DE)
Critical evaluation of anaerobic fermentation of waste products 'a management study', 11:29484 (R;FR)
Development of biogas technology in Ethiopia, 11:29471 (RA;DE)
Electrical control of a cogeneration set in parallel mains operation or in stand-by operation, 11:29480 (RA;DE)
FAL-biogas R/D project, 11:29482 (RA;DE)
Implementation of biogas strategy in livestock disciplines in Thailand, 11:29475 (RA;DE)
India's experiment with community biogas plants. Case study, 11:29500 (RA;DE)
Multiple utilization of the biomass, 11:29466 (RA;DE)
Pilot experiment for cooperative community biogas facilities in rural Egypt indicated social failure, 11:29470 (RA;DE)
Possibilities and limits of community biogas plants in the frame work of biogas propagation strategy in Viet Nam, 11:29477 (RA;DE)
Potential and development of biogas technology in Burundi: Options and constraints, 11:29465 (RA;DE;In French)
Primary approach to the engineering of centralized biogas supply system in Shanghai outskirts, 11:29467 (RA;DE)
Variants of biogas supply for the fictitious village of 'Rima', South East Asia, (threshold country). Case study, 11:29463 (RA;DE)
Chemical Explosions
Gas explosion characterization, wave propagation (small-scale experiments). Vol. 1, 11:30509 (R;FR)
Government Policies
Promotion of biogas in rural Thailand by the Population and Community Development Association (PDA), 11:29476 (RA;DE)
Oxidation
Chemical kinetics of hydrocarbon oxidation in gaseous detonations, 11:29489 (J;US)
Pyrolysis
Biomass thermochemical conversion program. 1985 annual report, 11:29486 (R;US)
Research Programs
FAL-biogas R/D project, 11:29482 (RA;DE)
Uses
Attempt of the biogas development and utilization. The introduction of the community biogas digesters and biogas distribution to each family in an agricultural research institute, 11:29468 (RA;DE)
Biogas technology for water pumping in Botswana, 11:29464 (RA;DE)
Electrical control of a cogeneration set in parallel mains operation or in stand-by operation, 11:29480 (RA;DE)
Implementation of biogas strategy in livestock disciplines in Thailand, 11:29475 (RA;DE)
India's experiment with community biogas plants. Case study, 11:29500 (RA;DE)
Multiple utilization of the biomass, 11:29466 (RA;DE)
Possibilities and limits of community biogas plants in the frame work of biogas propagation strategy in Viet Nam, 11:29477 (RA;DE)
Potential and development of biogas technology in Burundi: Options and constraints, 11:29465 (RA;DE;In French)

Primary approach to the engineering of centralized biogas supply system in Shanghai outskirts, 11:29467 (RA;DE)
Variants of biogas supply for the fictitious village of 'Rima', South East Asia, (threshold country). Case study, 11:29463 (RA;DE)
Yields
Non-aceticlastic methanogenesis from acetate: acetate oxidation by a thermophilic syntrophic coculture, 11:29487 (J;DE)
METHANOGENIC BACTERIA
Growth
Non-aceticlastic methanogenesis from acetate: acetate oxidation by a thermophilic syntrophic coculture, 11:29487 (J;DE)
METHANOL
Oxidation
Chemical kinetics of hydrocarbon oxidation in gaseous detonations, 11:29489 (J;US)
Solvent Properties
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
Thermodynamic Properties
Thermodynamic properties state equations of pure methanol and methanol-LiBr . $ZnBr_2$ solutions used in vapor absorption refrigeration and air-conditioning cycle, 11:29595 (RA;US)
METHANOL FUELS
Pure methanol, methanol-water mixtures, or methanol with additives; for methanol-gasoline mixtures, use GASOHOL.
Corrosive Effects
The effect of alcohol fueling on diesel engine durability, 11:30046 (B;US)
Performance Testing
Research and development of alcohol fuel useage in spark-ignited engines, 11:30069 (R;US)
The effect of alcohol fueling on diesel engine durability, 11:30046 (B;US)
METHANOL PLANTS
Feasibility Studies
MINO feasibility study. Concluding report (Pilot plant for gasification of peat and wood), 11:29153 (R;SE)
METHYL ALCOHOL
See METHANOL
METHYL IODIDE
Photochemical Reactions
Photochemical method for radioiodine abatement, 11:29311 (R;CA)
METHYL METHACRYLATE
Absorption Spectroscopy
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
Isomers
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
METHYL PHENOLS
See CRESOLS
METHYL PHENYL KETONE
See ACETOPHENONE
METHYL RADICALS
Oxidation
Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals, 11:30286 (J;US)
METHYL VIOLOGEN
See BIPYRIDINES
METHYLBENZENE
See TOLUENE
METHYLENE CHLORIDE
Nuclear Magnetic Resonance
Zero-field nuclear magnetic resonance of a nematic liquid crystal, 11:30239 (J;US)
Order Parameters
Zero-field nuclear magnetic resonance of a nematic liquid crystal, 11:30239 (J;US)
METHYL-FUEL
See ALCOHOLS
METHANOL
METROPOLITAN AREAS
See URBAN AREAS
MFTF DEVICES
Prior to October 1977, MX DEVICES was used to index this concept.
Beam Dumps
Active beam dump module design for MFTF-B, 11:31206 (J;US)
Computerized Simulation
Modeling and optimization of a test-cell upgrade for MFTF-B operating in the high neutron wall loading mode, 11:31188 (J;US)
Plasma engineering models of tandem mirror devices with high-field test-cell inserts, 11:30996 (J;US)
Cryopumps
Cryopumping hydrogen isotope mixtures in MFTF-B with and without argon adsorbent, 11:31254 (J;US)
Design
Modeling and optimization of a test-cell upgrade for MFTF-B operating in the high neutron wall loading mode, 11:31188 (J;US)
Magnetic Fields
Magnet alignment in MFTF-B, 11:31261 (BA;US)
Neutral Atom Beam Injection
Design of vacuum systems for MFTF-B neutral beamlines, 11:31205 (J;US)
Performance
The Mirror Fusion Test Facility (MFTF-B)--status, 11:31118 (J;US)
Plasma Confinement
Plasma engineering models of tandem mirror devices with high-field test-cell inserts, 11:30996 (J;US)
Plasma Simulation
Modeling and optimization of a test-cell upgrade for MFTF-B operating in the high neutron wall loading mode, 11:31188 (J;US)
Shields
MFTF-α+T shield design, 11:31155 (J;US)
Vacuum Systems
Design of vacuum systems for MFTF-B neutral beamlines, 11:31205 (J;US)
Wall Loading
Modeling and optimization of a test-cell upgrade for MFTF-B operating in the high neutron wall loading mode, 11:31188 (J;US)
MHD GENERATORS
Anodes
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Cathodes
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Electrical Faults
Distribution of electric fault currents in MHD faraday generators, 11:31267 (BA;US)
MICROBIAL PROCESSES
See BIOCONVERSION
MICROCOSMS
Uses
Use of aquatic microcosms for hazard identification, 11:30611 (RA;US)
MICRO-SCALE HYDROELECTRIC POWER PLANTS
Demonstration Programs
Microhydropower development in the United States: a demonstration project, 11:29492 (BA;CA)
MICROWAVE RADIATION
See also RELICT RADIATION
Wave Propagation
Propagation of long, high-power microwave pulses through the air, 11:30331 (R;US)
MIDDLE EAST
See also KUWAIT
OMAN
Economic Policy
Development potential and policies in the South Arabian countries Yemen Arab Republic, People's Democratic Republic of Yemen, Sultanate of Oman, 11:29938 (R;DE)

MIDWEST REGION
See FEDERAL REGION VII
MIGRATION (RADIONUCLIDE)
See RADIONUCLIDE MIGRATION
MILKY WAY
Galaxy Nuclei
Recent observations of the galactic center, 11:30772 (RA;JP)
H2 Regions
Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions, 11:30784 (R;US)
Star Evolution
Star formation in the inner galaxy: a far-infrared and radio study of two H2 regions, 11:30784 (R;US)
MILL TAILINGS
Erosion
Evaluation of chemical stabilizers and windscreens for wind erosion control of uranium mill tailings, 11:30557 (RA;US)
Radioactive Waste Disposal
Geologic considerations in UMTRA Project alternate site selection process, 11:29325 (RA;US)
Radionuclide Migration
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
MIM JUNCTIONS
Metal-Insulator-Metal Junctions.
Emission Spectra
Light emission from metal-insulator-metal structures biased near breakdown voltages, 11:30393 (R;US)
Emissivity
Light emission from metal-insulator-metal structures biased near breakdown voltages, 11:30393 (R;US)
MINE-MOUTH GENERATING PLANTS
See COAL MINES
FOSSIL-FUEL POWER PLANTS
MINERALS
Leaching
External factors influencing mineralization and immobilization of some radionuclides from tree litter, 11:30576 (BA;XA)
Surface Area
Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)
MINING
See also COAL MINING
OIL SHALE MINING
SURFACE MINING
Energy Consumption
1975, 1976 Energy Consumption Data Base for the Industrial Sector. Volume 3. Computer-related documentation. Final report, 11:29948 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 1. Documentation of results. Final report, 11:29979 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
MINORITY GROUPS
Contracts
General design of a technical assistance program to help DOE/prime contractor buyers in doing business with small disadvantaged businesses, 11:31272 (R;US)
MIRROR ADVANCED REACTOR STUDY
See MARS REACTOR
MIRROR FUSION TEST FACILITY
See MFTF DEVICES
MIRRORS
Design
Extreme ultraviolet multilayer reflectors, 11:30341 (R;US)
Fabrication
Extreme ultraviolet multilayer reflectors, 11:30341 (R;US)
Mathematical Models
Spectral and parameter estimation problems arising in the metrology of high performance mirror surfaces, 11:30955 (R;US)
Protective Coatings
Thin film coatings for improved alpha/epi, 11:29542 (RA;US)
MIRRORS (MAGNETIC)
See MAGNETIC MIRRORS
MISGURNUS
See FISHES
MISSISSIPPI
Salt Deposits
Evaluation of the structure and stratigraphy over Richton Dome, Mississippi, 11:30738 (R;US)
MISSOURI
Dolomite
Geochemistry and origin of regional dolomites. Final report, July 15, 1983-July 14, 1985, 11:30758 (R;US)
MITES
Population Dynamics
Long-term ecological study in the Oak Ridge area. III. The oribatid mite fauna in pine litter, 11:30577 (J;US)
MIXED OXIDE FUELS
Uranium dioxide mixed with other oxides.
Mass Spectroscopy
High temperature mass spectrometry study on fast-neutrons-nuclear-reactor irradiated fuel, 11:29806 (R;FR)
MIXERS
Design
Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)
Performance Testing
Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)
MIXING
Not for CONFIGURATION MIXING.
Mathematical Models
Modeling of convective mixing downstream of separately heated annuli, 11:30378 (R;US)
MOBILE REACTORS
Designed to be movable while in operation.
See also SPACE POWER REACTORS
Design
Design, manufacturing and commissioning of mobile unit for EDF (Dow Chemical process), 11:29358 (RA;US)
MOBILITY
Not for material movement; see also TRANSPORT.
Control
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
MODELS (COSMOLOGICAL)
See COSMOLOGICAL MODELS
MODELS (MATHEMATICAL)
See MATHEMATICAL MODELS
MODELS (PARTICLE)
See PARTICLE MODELS
MODELS (PLASMA)
See PLASMA SIMULATION
MODELS (STATISTICAL)
See STATISTICAL MODELS
MODIFICATIONS
Cost
Great Plains Coal Gasification Plant start-up and modification report, 11:29154 (R;US)
Economics
Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)
MOLDS (CASTING)
See CASTING MOLDS
MOLECULAR ORBITAL MODEL
See MOLECULES
MOLECULES
See also POLYATOMIC MOLECULES
Dynamics
Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986, 11:30194 (R;US)
Spectra
Exact thermal rotational spectrum of a two-dimensional rigid rotor obtained using Gaussian wave packet dynamics, 11:30817 (J;US)

MOLTEN CARBONATE FUEL CELLS
Prior to June 1980 this information was indexed with the descriptors HIGH-TEMPERATURE FUEL CELLS + MOLTEN SALTS + CARBONATES.
Catalyst Supports
Integrated current collector and catalyst support, 11:29984 (P;US)
Design
Electrolyte reservoir for carbonate fuel cells, 11:29985 (P;US)
Integrated current collector and catalyst support, 11:29984 (P;US)
Electrodes
Electrolyte reservoir for carbonate fuel cells, 11:29985 (P;US)
Integrated current collector and catalyst support, 11:29984 (P;US)
Electrolytes
Coated powder for electrolyte matrix for carbonate fuel cell, 11:29986 (P;US)
Electrolyte reservoir for carbonate fuel cells, 11:29985 (P;US)
Erosion
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Fabrication
Coated powder for electrolyte matrix for carbonate fuel cell, 11:29986 (P;US)
Performance
The role of heat transfer in molten carbonate fuel cell performance, 11:29987 (B;US)
Research Programs
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Thermal Conduction
The role of heat transfer in molten carbonate fuel cell performance, 11:29987 (B;US)
MOLTEN SALT COOLANTS
See MOLTEN SALTS
MOLTEN SALTS
Corrosive Effects
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
MOLYBDENUM
Activation Analysis
Certification of carbon and nitrogen in molybdenum (BCR No. 23), 11:30178 (R;FR)
Calibration Standards
Certification of carbon and nitrogen in molybdenum (BCR No. 23), 11:30178 (R;FR)
Catalytic Effects
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
MOLYBDENUM 92 TARGET
Neon 20 Reactions
X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus, 11:30912 (R;FR;In French)
MOLYBDENUM ALLOYS
See also HASTELLOYS
INCONEL 625
STAINLESS STEEL-316
Materials Testing
Development of ferritic steels for reduced activation: the US program, 11:30081 (R;US)
Physical Radiation Effects
Radiation-induced segregation and precipitation in molybdenum-rhenium alloys, 11:30083 (R;US)
Tensile Properties
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)
MOLYBDENUM COMPLEXES
Chemical Preparation
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_3Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Crystal Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_3Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Decomposition
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Electronic Structure
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Excited States
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Molecular Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_3Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Normal-Mode Analysis
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Oxidation
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Radiolysis
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Reduction
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
MONITORED RETRIEVABLE STORAGE
Cooling Systems
Temperature history for canistered fuel lag storage areas during the loss of cooling air at the receiving and handling building of the MRS Facility, 11:29302 (R;US)
Design
Staff evaluation of US Department of Energy proposal for monitored retrievable storage, 11:29300 (R;US)
Evaluation
Staff evaluation of US Department of Energy proposal for monitored retrievable storage, 11:29300 (R;US)
Heat Transfer
Temperature history for canistered fuel lag storage areas during the loss of cooling air at the receiving and handling building of the MRS Facility, 11:29302 (R;US)
Storage Facilities
Simulation of the MRS receiving and handling facility, 11:29423 (BA;US)
MONITORS
See also RADIATION MONITORS
Design
High resolution in situ ultrasonic corrosion monitor, 11:29807 (P;US)

Portable monitor for solar radiation that accumulates irradiance histograms for 32 leaf-mounted sensors, 11:30505 (J;NL)
Meetings
Review of the OECD specialist meeting on continuous monitoring techniques for assuring coolant circuit integrity, 11:29870 (J;US)
MONITORS (RADIATION)
See RADIATION MONITORS
MONITORS (REACTOR)
See REACTOR CONTROL SYSTEMS
MONOCARBOXYLIC ACIDS
See also ABSCISIC ACID
DODECANOIC ACID
FORMIC ACID
HEXADECANOIC ACID
OCTADECANOIC ACID
Labelling
Synthesis and biological evaluation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid, a new dimethyl-branched long-chain fatty acid to evaluate regional myocardial fatty acid uptake, 11:30661 (R;US)
Subcellular Distribution
Synthesis and biological evaluation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid, a new dimethyl-branched long-chain fatty acid to evaluate regional myocardial fatty acid uptake, 11:30661 (R;US)
Tissue Distribution
Synthesis and biological evaluation of (E)-19-iodo-3,3-dimethyl-18-nonadecenoic acid, a new dimethyl-branched long-chain fatty acid to evaluate regional myocardial fatty acid uptake, 11:30661 (R;US)
MONOCHROMATORS
Design
Pulsed-neutron monochromator, 11:30492 (P;US)
MONOCLONAL ANTIBODIES
Cross-Linking
Test of a theory relating to the cross-linking of IgE antibody on the surface of human basophils, 11:30626 (J;US)
MONOCRYSTALS
See also WHISKERS
Crystal Growth
Crystal growth and properties of trinickel boride, Ni_3B, 11:30140 (J;NL)
Mechanical Properties
Crystal growth and properties of trinickel boride, Ni_3B, 11:30140 (J;NL)
Structural Chemical Analysis
Crystal growth and properties of trinickel boride, Ni_3B, 11:30140 (J;NL)
MONOPOLES
See also MAGNETIC MONOPOLES
Introduction to monopole-fermion dynamics, 11:30867 (RA;JP)
Meetings
Proceedings of the workshop on 'monopoles and proton decay', 11:30822 (R;JP)
Stability
Stability of SU(2) monopole in the presence of chiral fermions analysed on computers, 11:30858 (R;XA)
MONOSACCHARIDES
Labelling
Design, synthesis and evaluation of 2-deoxy-2-iodovinyl-branched carbohydrates as potential brain imaging agents, 11:30652 (R;US)
Tissue Distribution
Design, synthesis and evaluation of 2-deoxy-2-iodovinyl-branched carbohydrates as potential brain imaging agents, 11:30652 (R;US)
MONTANA
See also POWDER RIVER BASIN
Sheep
Ural-Tweed bighorn sheep - wildlife mitigation project. Annual report, 1 September 1984-31 December 1985, 11:30590 (R;US)
MORBIDITY
See DISEASE INCIDENCE
MORTALITY
Mathematical Models
Thyroid effects, 11:30695 (RA;US)
MOS TRANSISTORS
Metal Oxide Silicon transistors.
Physical Radiation Effects
Activation energies of recovery of the oxide charge created by ionizing pulse, energies being taken related to room temperature during irradiation and related to process oxidation temperature, 11:30150 (R;FR;In French)
MOSSES
Comparative Evaluations
Retention of simulated fallout particles by lichens and mosses, 11:30587 (J;US)
MOUNTAINS
See also YUCCA MOUNTAIN
Orogenesis
Structure and evolution of the Horse Heaven Hills in South-Central Washington, 11:29414 (R;US)
MULE DEER
See DEER
MULTI-CHANNEL ANALYZERS
Performance Testing
Performance report for Stanford/SLAC Multi-Channel Sample-and-Hold Device, 11:30457 (J;US)
MULTIPROCESSORS
See ARRAY PROCESSORS
MULTIVARIATE ANALYSIS
Zero models and pole models for multivariable systems, 11:30960 (R;US)
MULTIWIRE DRIFT CHAMBERS
See DRIFT CHAMBERS
MULTIWIRE PROPORTIONAL CHAMBERS
See also DRIFT CHAMBERS
Anodes
Charge division using carbon filaments for obtaining coordinate information from detection of single electrons, 11:30478 (J;US)
Efficiency
Mesh chambers for positron emission tomography, 11:30666 (J;US)
Filaments
Charge division using carbon filaments for obtaining coordinate information from detection of single electrons, 11:30478 (J;US)
Performance
Properties of a barium fluoride-TMAE-multiwire proportional chamber detector using a large single crystal, 11:30451 (J;US)
Spatial Resolution
Mesh chambers for positron emission tomography, 11:30666 (J;US)
Time Resolution
Mesh chambers for positron emission tomography, 11:30666 (J;US)
MUNICIPAL BUILDINGS
See PUBLIC BUILDINGS
MUNICIPAL WASTES
Anaerobic Digestion
Bioconversion: a new technology for waste and sludge disposal. Workshop proceedings, 11:29460 (R;US)
Ground Disposal
Depositions of environmental pollutants, 11:30023 (R;DE;In German)
MUON-CATALYZED FUSION
Engineering
Engineering issues in muon-catalyzed fusion, 11:30998 (J;US)
Experiment Planning
Engineering issues in muon-catalyzed fusion, 11:30998 (J;US)
Reviews
Muon catalyzed fusion, 11:31077 (R;US)
MUSEUMS
See EDUCATIONAL FACILITIES

MUTAGEN SCREENING
Information Needs
Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 1. Extrapolation from animals to man, 11:30716 (R;US)
MUTAGENESIS
Biochemistry
Biology Division progress report, October 1, 1984-September 30, 1985, 11:30720 (R;US)
MUTATIONS
See also CHROMOSOMAL ABERRATIONS
Bioassay
Prospects for cellular mutational assays in human populations, 11:30723 (BA;US)
MWPC
See MULTIWIRE PROPORTIONAL CHAMBERS
MX DEVICES
See MFTF DEVICES
MYOCARDIUM
Single Photon Emission Computed Tomography
Quantitative studies in radiopharmaceutical science. Progress report, January 1-December 31, 1985, 11:30663 (R;US)

N

NAI DETECTORS
Performance
Examination of the role of detection systems in quantitation and image quality in PET, 11:30439 (J;US)
Highly segmented NaI(Tl) detector with vacuum photodiode readout for measuring electromagnetic showers at the CERN ISR, 11:30485 (J;NL)
NAPHTHA
Boiling point range 0-204°C.
Inventories
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Production
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
NAPHTHALENE
Hydrogenation
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
Phosphorescence
Effect of high pressure on critical concentration energy transport in isotopically mixed naphthalene crystals, 11:30255 (J;US)
Solvent Properties
Phase behavior of coal fluids: data for correlation development. Report for the period: November 1, 1985-January 31, 1986, 11:29176 (R;US)
NAPHTHOLS
Chemical Preparation
Synthesis, rapid resolution, and determination of absolute configuration of racemic 2,2'-binaphthyldiyl crown ethers and analogues via β-cyclodextrin complexation, 11:30260 (J;US)
Chemical Reactions
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)
Configuration
Synthesis, rapid resolution, and determination of absolute configuration of racemic 2,2'-binaphthyldiyl crown ethers and analogues via β-cyclodextrin complexation, 11:30260 (J;US)
Synthesis
Synthesis of oxygen-18 enriched phenol and naphthol from $^{18}O_2$, 11:30278 (J;GB)
NAPHTHOLS-ALPHA
See NAPHTHOLS
NAPHTHOLS-BETA
See NAPHTHOLS
NATIONAL DEFENSE
See also BALLISTIC MISSILE DEFENSE
Decision Making
Simple ballistic-missile-defense model to help decision makers, 11:30517 (J;US)
Planning
Simple ballistic-missile-defense model to help decision makers, 11:30517 (J;US)
NATIONAL REACTOR TESTING STATION
See IDAHO NATIONAL ENGINEERING LABORATORY
NATURAL GAS
Environmental Effects
Ecological benefits of natural gas. A choice of illustrative papers, 11:30542 (R;DE;In German)
NATURAL GAS DEPOSITS
Seismic Surveys
Acoustic velocity measurements in materials using a regenerative method, 11:29232 (P;US)
NATURAL GAS INDUSTRY
Energy Consumption
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume IA. Appendices with 1975 data. Final report, 11:29946 (R;US)
Field Production Equipment
Costs and indices for domestic oil and gas field equipment and production operations, 1985, 11:29245 (R;US)
Offshore Operations
Offshore oil and gas. A bibliography, 11:29230 (R;GB)
NEGATIVE IONS
See ANIONS
NEODYMIUM
Isotope Ratio
Removal of isobaric interferences by resonance ionization mass spectrometry, 11:30188 (J;US)
NEODYMIUM LASERS
Design
Efficient generation of tunable radiation below 100 nm in krypton, 11:30370 (BA;US)
Extreme Ultraviolet Radiation
Efficient generation of tunable radiation below 100 nm in krypton, 11:30370 (BA;US)
NEON
Radiolysis
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
NEON 20 REACTIONS
Angular Correlation
Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions, 11:30906 (R;JP)
Charge-Exchange Reactions
Excitation of the Δ resonance in relativistic heavy ion charge exchange reactions, 11:30905 (RA;US)
Coincidence Spectrometry
Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions, 11:30906 (R;JP)
Compound-Nucleus Reactions
X detection in heavy ion induced reactions. Application to the lifetime measurement of a compound nucleus, 11:30912 (R;FR;In French)
Quasi-Elastic Scattering
Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions, 11:30906 (R;JP)
Total Cross Sections
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
NEOPLASMS
Neutron Therapy
Single-ring magnetic cusp low gas pressure ion source, 11:30668 (P;US)
NEPAL
Biomass Conversion Plants
Socio-economic impacts of community biogas plants in Nepal, 11:29474 (RA;DE)

NEPTUNIUM
Adsorption
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Radiochemistry
Radiochemistry of uranium, neptunium and plutonium: an updating, 11:30311 (R;US)
NETHERLANDS
Service Sector
Electricity consumption in the tertiary sector (The Netherlands), 11:29952 (RA;US)
NETWORKS (COMPUTER)
See COMPUTER NETWORKS
NEUTRAL BEAM SOURCES
Computerized Control Systems
Expert system to control a fusion energy experiment, 11:31084 (R;US)
NEUTRINO DETECTION
Background Noise
Reactor antineutrino background at Gran Sasso, 11:30424 (R;FR)
NEUTRINO OSCILLATION
Neutrino oscillation, 11:30828 (RA;JP)
NEUTRINOS
See also ELECTRON NEUTRINOS
Rest Mass
Massive neutrinos in particle physics and astrophysics, 11:30872 (R;US)
NEUTRON ABSORBERS
Detection
Method and apparatus for determining the content and distribution of a thermal neutron absorbing material in an object, 11:30479 (P;US)
NEUTRON ACTIVATION ANALYSIS
See NEUTRON REACTIONS
NEUTRON CAPTURE
See NEUTRON REACTIONS
NEUTRON DETECTION
Computerized Simulation
Using last event estimator for detection calculations, 11:30945 (R;FR)
Plastic Scintillation Detectors
Neutron polarimeter for (p, n) measurements at intermediate energies, 11:30487 (J;NL)
Polarimeters
Neutron polarimeter for (p, n) measurements at intermediate energies, 11:30487 (J;NL)
NEUTRON DETECTORS
See also SELF-POWERED NEUTRON DETECTORS
Design
Method and apparatus for determining the content and distribution of a thermal neutron absorbing material in an object, 11:30479 (P;US)
NEUTRON DIFFUSION EQUATION
Asymptotic Solutions
Asymptotic time dependent neutron transport in multidimensional systems, 11:30944 (R;EG)
Numerical Solution
Geometry-independent approach to coarse-mesh neutron diffusion calculations, 11:29793 (R;US)
NEUTRON DOSIMETRY
Calibration Standards
Effective threshold cross sections for sulphur and indium fast neutron reactions, 11:30493 (J;GB)
Proportional Counters
A new type of REM measuring instrument, 11:30440 (J;US)
Tissue-Equivalent Detectors
A new type of REM measuring instrument, 11:30440 (J;US)
NEUTRON FLUX DENSITY
See FLUX DENSITY
NEUTRON REACTIONS
Charge Exchange
Future possibilities for (n,p) studies at intermediate energies, 11:30941 (BA;US)
Cross Sections
Evaluation of neutron nuclear data of ^{7}Li for JENDL-3, 11:30902 (R;JP)
Evaluation of neutron nuclear data of ^{6}Li for JENDL-3, 11:30901 (R;JP)
Evaluation of neutron nuclear data of ^{9}Be for JENDL-3, 11:30903 (R;JP)
Neutron nuclear data of ^{9}Be adopted in JENDL-2, 11:30900 (R;JP)
Neutron nuclear data of ^{7}Ni adopted in JENDL-2, 11:30899 (R;JP)
Giant Resonance
Future possibilities for (n,p) studies at intermediate energies, 11:30941 (BA;US)
NEUTRON SOURCES
Excludes reactors even when used as neutron sources.
Design
Single-ring magnetic cusp low gas pressure ion source, 11:30668 (P;US)
NEUTRON SPECTROMETERS
Performance
Improved constant-Q spectrometer for pulsed neutron sources, 11:30486 (J;NL)
Pulsed Neutron Techniques
Improved constant-Q spectrometer for pulsed neutron sources, 11:30486 (J;NL)
NEUTRON-DEFICIENT ISOTOPES
Nuclear Structure
Nuclear structure studies far from the line of beta stability, 11:30930 (R;US)
NEUTRON-GAMMA LOGGING
Response Functions
Simulated borehole for ore depth evaluation by neutron capture gamma-ray technique using Pu/Be neutron source, 11:30507 (R;EG)
NEUTRON-RICH ISOTOPES
Nuclear Structure
Nuclear structure studies far from the line of beta stability, 11:30930 (R;US)
NEUTRONS
See also EPITHERMAL NEUTRONS
FAST NEUTRONS
SLOW NEUTRONS
THERMAL NEUTRONS
Scattering
Collective motions in dense fluids observed in neutron scattering, 11:30949 (R;GB)
Time-of-Flight Method
Comparison of diode voltage and ion energy for an intense pulsed ion-beam diode, 11:31268 (BA;US)
NEVADA TEST SITE
Alluvial Deposits
Inflow to a crack in playa deposits of Yucca Lake, Nevada Test Site, Nye County, Nevada, 11:30745 (R;US)
Climates
Vegetation and climates of the last 45,000 years in the vicinity of the Nevada Test Site, south-central Nevada (NNWSI project), 11:30744 (R;US)
Plants
Vegetation and climates of the last 45,000 years in the vicinity of the Nevada Test Site, south-central Nevada (NNWSI project), 11:30744 (R;US)
NEW ENGLAND
See FEDERAL REGION I
NEW HAMPSHIRE
Air Quality
Statistical analysis of relationships between precipitation chemistry and air quality in New Hampshire and precursor emissions, 11:30553 (J;US)
NEW YORK
Geothermal Resources
Heat flow and subsurface temperature distributions in central and western New York. Final report, 11:29617 (R;US)
Land Use
Exploration of the relationships among acidic deposition, land use, and water chemistry, 11:30578 (R;US)

Radioactive Waste Management
New York State interim waste management cost evaluation, 11:29323 (RA;US)
Water Chemistry
Exploration of the relationships among acidic deposition, land use, and water chemistry, 11:30578 (R;US)
NEW YORK BIGHT
Anoxia
Oxygen depletion in the New York apex: causes and consequences, 11:30613 (J;US)
NEW ZEALAND
Coal Deposits
Seismic surveys at Blackburn, Buller coal fields, New Zealand, 11:29202 (R;NZ)
NEWTS
See SALAMANDERS
NICKEL
Catalytic Effects
Coal liquefaction study under the nonisothermal reaction temperature. Quarterly progress report, January-March 1986, 11:29162 (R;US)
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Environmental Transport
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Fracture Properties
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Hydrogen Embrittlement
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Stress Corrosion
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
Surface Properties
Dynamics of dissociative adsorption of hydrogen on Ni(100), 11:30216 (J;US)
Tissue Distribution
Electrothermal atomic absorption spectrophotometry of nickel in tissue homogenates, 11:30654 (J;US)
Uptake
Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
NICKEL 58
Isotope Separation
Selective heating and separation of isotopes in a metallic plasma, 11:31012 (BA;US)
NICKEL ALLOYS
See also HASTELLOYS
MARAGING STEELS
NICKEL BASE ALLOYS
NICKEL STEELS
Tensile Properties
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)
NICKEL BASE ALLOYS
Corrosion Resistance
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
Materials Testing
FY 1984 and FY 1985 geochemistry and materials studies in support of the Magma Energy Extraction Program, 11:29639 (R;US)
Oxidation
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
Physical Radiation Effects
Radiation-induced segregation in light-ion bombarded Ni-8% Si, 11:30088 (R;US)
Protective Coatings
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
NICKEL BORIDES
Crystal Growth
Crystal growth and properties of trinickel boride, Ni_3B, 11:30140 (J;NL)
Mechanical Properties
Crystal growth and properties of trinickel boride, Ni_3B, 11:30140 (J;NL)
Structural Chemical Analysis
Crystal growth and properties of trinickel boride, Ni_3B, 11:30140 (J;NL)
NICKEL CHLORIDES
Biological Effects
Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
NICKEL COMPLEXES
Catalytic Effects
Mechanistic investigation of carbon-carbon bond formation in the reduction of alkyl halides by organonickel complexes in aqueous solution (R'X (R' = CH_3, C_2H_5, 1-C $_3H_7$, 2-C_3H_7, and $PhCH_2$; X = Cl, Br, I) $RNi(tmc)^+$ (R = C_2H_5, C_3H_7, and CH_3-c-C_6H_9; tmc = (1R,4R,8S,11S)-1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane)), 11:30247 (J;US)
Oxidation
Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex (Ni(IR, 4R 8S, 11S - tmc)$^+$; tmc = 1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane; and R = CH_3, C_2H_5, C_3H_7, or $CH_3CH(CH_2)_3$ CH_3 + c - $C_6H_9CH_3$), 11:30246 (J;US)
Photochemical Reactions
Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study, 11:30296 (J;GB)
NICKEL COMPOUNDS
See also NICKEL BORIDES
NICKEL CHLORIDES
NICKEL OXIDES
Chemical Radiation Effects
Effects of alpha irradiation on barium hollandite and nickel-iron spinel, 11:30306 (J;US)
Polymerization
Raman spectroscopy of polymers of metal protoporphyrin free acids on metal electrodes, 11:30283 (J;US)
NICKEL OXIDES
Impurities
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
NICKEL STEELS
Fracture Properties
Application of the key curve and multi-specimen techniques to dynamic J-R Curve testing of alloy steel, 11:30104 (R;US)
Optimization
Design of tough ferritic steels for cryogenic use, 11:30100 (R;US)
NICKEL-IRON BATTERIES
See IRON-NICKEL BATTERIES
NIOBATES
Specific compounds should be indexed by coordination of a descriptor in the form (CATION) COMPOUNDS and the above anion descriptor.
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
NIOBIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
NIOBIUM 95
Diffusion
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
NIOBIUM ALLOYS
See also INCONEL 600
INCONEL 625
Creep
Verification tests of a high-temperature transverse creep model for Zr-2.5 wt % Nb pressure tubes, 11:30070 (R;CA)

Phase Transformations
Model for growth of beta-phase particles in zirconium-2.5 wt% niobium, 11:30119 (R;CA)
Stability
Thermal aging effects in refractory metal alloys, 11:29786 (R;US)
NIOBIUM COMPOUNDS
See also NIOBATES
NIOBIUM OXIDES
Crystal-Phase Transformations
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Formation Free Energy
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Specific Heat
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Stability
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
NIOBIUM OXIDES
Crystal Structure
Partial structure-field map for $A^{3+}B^{5+}O_4$ compounds, 11:30135 (J;NL)
NITRATES
See also PETN
PLUTONIUM NITRATES
URANYL NITRATES
Diffusion
Transport of nitrate from a large cement based waste form, 11:29436 (R;US)
Fluorescence
Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985, 11:30234 (R;US)
Pyrolysis
Fourier transform infrared spectroscopic study of the thermal stability of peroxyacetyl nitrate, 11:30256 (J;US)
Solubility
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)
Thermodynamic Properties
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)
NITRIC ACID
Ecological Concentration
Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
NITRIC OXIDE
NO.
Absorption Spectroscopy
FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3, 11:30214 (J;US)
Air Pollution Monitoring
Nitric oxide (NO) emissions from combustion of retorted oil shale, 11:29282 (BA;US)
Chemisorption
FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3, 11:30214 (J;US)
Desorption
FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3, 11:30214 (J;US)
Emission
Nitric oxide (NO) emissions from combustion of retorted oil shale, 11:29282 (BA;US)
Normal-Mode Analysis
FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3, 11:30214 (J;US)
NITRO COMPOUNDS
See also NITROBENZENE
NITROMETHANE
Decomposition
Photooxidation of 2,4-dinitrotoluene in aqueous solution in the presence of hydrogen peroxide, 11:30612 (J;US)
Water Chemistry
Photooxidation of 2,4-dinitrotoluene in aqueous solution in the presence of hydrogen peroxide, 11:30612 (J;US)
NITROBENZENE
Infrared Spectra
Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985, 11:29183 (R;US)
Liquid Column Chromatography
Identification of nonvolatile coal derived products via chromatography coupled with on-line FTIR detection. Quarterly progress report, September 1-November 30, 1985, 11:29183 (R;US)
NITROGEN
Activation Analysis
Certification of carbon and nitrogen in molybdenum (BCR No. 23), 11:30178 (R;FR)
Adsorption
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Adsorption Isotherms
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Chemical Explosions
Gas explosion characterization, wave propagation (small-scale experiments). Vol. 1, 11:30509 (R;FR)
Gas explosion characterization, wave propagation (half-scale experiments). Vol. 2, 11:30510 (R;FR)
Combustion Kinetics
Kinetics of nitrogen and sulfur reactions in combustion systems. Quarterly report No. 3, 11:29187 (R;US)
Metabolism
Influence of shade on the growth and nitrogen assimilation of developing fruits on bell pepper, 11:30656 (J;US)
Nitrogen regeneration by the subtropical marine copepod Eucalanus pileatus, 11:30657 (J;GB)
NITROGEN 13
Radiochemistry
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
NITROGEN 16
Beta Decay
0^- to 0^+ beta decay in A = 16, 11:30904 (BA;US)
NITROGEN COMPOUNDS
See also NITRATES
NITROGEN OXIDES
Chemical Reactions
Theoretical studies of the energetics and mechanisms of chemical reactions: abstraction reactions, 11:30206 (J;US)
Molecular Structure
Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON, 11:30211 (J;US)
Normal-Mode Analysis
Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON, 11:30211 (J;US)
NITROGEN DIOXIDE
NO_2.
Oxidation
Kinetics of one-electron transfer reactions involving ClO_2 and NO_2, 11:30204 (J;US)
NITROGEN IONS
Recombination
Automatic measurement of characteristic quantities of nuclear plasma, 11:30968 (R;FR;In French)
NITROGEN NITRIDES
See NITROGEN
NITROGEN OXIDES
See also NITRIC OXIDE
NITROGEN DIOXIDE
Air Pollution
Forecasting future industrial SO_2 and NO/sub x/ emissions, 11:30551 (J;US)
NO/sub x/ control efforts increase, 11:30624 (RA;US)

Air Pollution Abatement
Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
Control
Kinetics of nitrogen and sulfur reactions in combustion systems. Quarterly report No. 3, 11:29187 (R;US)
Emission
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
Environmental Transport
Assessing environmental effects of oil-fuelled energy systems, 11:30527 (R;IT)
Pollution Regulations
An overview of international NO/sub x/ control regulations, 11:29229 (R;GB)
Reduction
Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
Removal
Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
NITROMETHANE
Chemical Reaction Yield
Production of the nitromethane aci ion by UV irradiation: its effect on detonation sensitivity, 11:30515 (J;US)
Photolysis
Production of the nitromethane aci ion by UV irradiation: its effect on detonation sensitivity, 11:30515 (J;US)
Reaction Intermediates
Production of the nitromethane aci ion by UV irradiation: its effect on detonation sensitivity, 11:30515 (J;US)
NITROSO COMPOUNDS
Binding Energy
Comparison of thionitrosyl and nitrosyl bonding in dicarbonyl(eta^5-cyclopentadienyl)chromium complexes by gas-phase ultraviolet and x-ray photoelectron spectroscopy, 11:30266 (J;US)
Genetic Effects
Saturation of repair, 11:30722 (BA;US)
NMR
See NUCLEAR MAGNETIC RESONANCE
NMR SPECTRA
Data Analysis
Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985, 11:29177 (R;US)
NMR SPECTROMETERS
Optimization
Solid state NMR methods for coal science. Progress report, October 1-December 31, 1985, 11:29177 (R;US)
NONLEPTONIC DECAY
See WEAK HADRONIC DECAY
NONLUMINOUS MATTER
(In outer space.)
Gamma Spectra
Probing the structure of the galactic halo with gamma rays produced by WIMP annihilations, 11:30764 (R;US)
NONRADIOACTIVE WASTES
See GASEOUS WASTES
LIQUID WASTES
SOLID WASTES
NORTH AMERICA
See also CANADA
USA
Atmospheric Circulation
Plateau monsoons of the northern hemisphere: a comparison between North America and Tibet, 11:30522 (J;US)
NORTH ATLANTIC REGION
See FEDERAL REGION I
NORTH CAROLINA
Micro-Scale Hydroelectric Power Plants
Microhydropower development in the United States: a demonstration project, 11:29492 (BA;CA)
Streams
Floods on North Toe River and Beaver, Grassy, and East Fork Grassy Creeks in the vicinity of Spruce Pine, North Carolina, 11:30743 (R;US)
NORTHERN IRELAND
See UNITED KINGDOM
NORWAY
Commercial Sector
Energy use in Norway's commercial sector (1965-1983), 11:29950 (RA;US)
Energy use in the commercial sector: the Norwegian energy consumption system and physical/technical energy models, 11:29968 (RA;US)
Service Sector
Data collection in the service sector, 11:29964 (RA;US)
Forecast for energy consumption in the service sector, 11:29969 (RA;US)
NOVA FACILITY
Optical Systems
Coatings for high energy applications. The Nova laser, 11:31083 (R;US)
NOVAE
Hydrodynamic Model
Hydrodynamic models for novae with ejecta rich in oxygen, neon and magnesium, 11:30785 (R;US)
Stellar Flares
Hydrodynamic models for novae with ejecta rich in oxygen, neon and magnesium, 11:30785 (R;US)
NOVETTE FACILITY
Inertial Confinement
Progress in inertial fusion at LLNL, 11:31217 (J;US)
X-Ray Lasers
Progress in inertial fusion at LLNL, 11:31217 (J;US)
NRTS
See IDAHO NATIONAL ENGINEERING LABORATORY
NUCLEAR ACCIDENTS
See ACCIDENTS
NUCLEAR ATTACKS
See NUCLEAR WEAPONS
NUCLEAR CASCADES
Computer Calculations
Nucleon-meson cascade calculations by Monte Carlo methods, 11:30946 (R;US)
NUCLEAR CHEMISTRY
Nuclear chemistry at Rochester, 11:30315 (R;US)
NUCLEAR CONTROVERSY
See HUMAN POPULATIONS
NUCLEAR DATA COLLECTIONS
Attempt for revision of JNDC FP Decay Data File, 11:30913 (R;JP)
Data Acquisition
Harwell version of the DLC37F nuclear data library, 11:30889 (R;GB)
International Cooperation
US/JAERI calculational benchmarks for nuclear data and codes intercomparison. Article 8, 11:31032 (R;US)
Meetings
Assessment of the current status of basic nuclear data compilations, 11:30890 (R;US)
NUCLEAR ENGINEERING
Surveys
Nuclear engineering enrollments and degrees, 1985, 11:31271 (R;US)
NUCLEAR EXPLOSION DETECTION
Discrimination of NTS explosions and western United States earthquakes: data processing, 11:30518 (R;US)
NUCLEAR FACILITIES
See also FUEL REPROCESSING PLANTS
NUCLEAR POWER PLANTS
RADIOACTIVE WASTE FACILITIES
Communications
Improving security communications at fixed-site facilities, 11:29454 (R;US)
Security
Improving security communications at fixed-site facilities, 11:29454 (R;US)
NUCLEAR FORCES
Temperature Dependence
Towards temperature dependant nuclear forces for the description of hot nuclei, 11:30936 (R;FR)
NUCLEAR FRAGMENTS
See also FISSION FRAGMENTS
HYPERNUCLEI

Statistical Mechanics
Microcanonical simulation of nuclear disassembly, 11:30937 (R;US)
NUCLEAR FUEL ELEMENTS
See FUEL ELEMENTS
NUCLEAR FUELS
See also ALLOY NUCLEAR FUELS
SPENT FUELS
Burnup
Department of Energy extended burnup data base. Final report, 11:29749 (R;US)
Fission Product Release
Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501, 11:29855 (R;US)
Effects of time and other variables on fission product release rates, 11:29748 (R;US)
NUCLEAR INSURANCE
Government Policies
Price-Anderson Act Amendments Act of 1985. Hearing before the Subcommittee on Energy Research and Development of the Committee on Energy and Natural Resources, United States Senate, Ninety-Ninth Congress, First Session on S. 1225, June 25, 1985, 11:29874 (B;US)
NUCLEAR MAGNETIC RESONANCE
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
NUCLEAR MATERIALS MANAGEMENT
Accounting
Review of NRTMA statistical tests, 11:29451 (R;GB)
NUCLEAR MEDICINE
Research Programs
Fiscal year 1986 DOE budget authorization: environmental research and development. Hearings before the Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science and Technology, US House of Representatives, Ninety-Ninth Congress, First Session, March 20, 26, 1985, No. 38, 11:30670 (B;US)
NUCLEAR PHYSICS
Use only for indexing articles of very broad coverage, such as annual reviews, text books, etc.
Evaluated Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Experimental Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Historical Aspects
Reflection of the classical age in the intermediate energy physics, 11:30934 (R;JP)
Research Programs
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Theoretical Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
NUCLEAR POWER PLANTS
Compressed Gases
Safety implications associated with in-plant pressurized gas storage and distribution systems, 11:29872 (J;US)
Computer Codes
Analysis of the certification process of computer programs used in a nuclear power plant, using the management systems approach, 11:29846 (R;US)
Construction
Nuclear regulation. Oversight of quality assurance at nuclear power plants needs improvement, 11:29787 (R;US)
Control Systems
Advanced German Operator Support Systems, 11:29871 (J;US)
Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)
Diesel Engines
Review of issues related to improving nuclear power plant diesel generator reliability, 11:29803 (R;US)
Economic Impact
Local economic impacts associated with pure taxable capacity changes, 11:29790 (J;US)
Electrical Equipment
Taking qualification requirements into account at the different levels of engineering. Nuclear qualification of electrical equipments, 11:29799 (R;FR;In French)
Emergency Plans
Report to the NRC on guidance for preparing scenarios for emergency preparedness exercises at nuclear generating stations. Draft report for comment, 11:29851 (R;US)
Energy Conversion
Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Engineered Safety Systems
Nuclear plant aging research program activities, 11:29833 (R;US)
Environmental Impacts
Stochastic models for predicting environmental impact in aquatic ecosystems, 11:30615 (RA;US)
Using aquatic simulation models for impact assessment: evaluation of monitoring programs, 11:30614 (RA;US)
Equipment
Qualification testing evaluation (QTE) program, FIN A-1051, Case 0686. Bimonthly status report, February-March 1986, 11:29797 (R;US)
Filters
Operational experiences of non-precoated type filters (super fine filter) in PWR and BWR nuclear power plants, 11:29812 (RA;US)
Fuel Assemblies
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume I. Equations and numerics, 11:29800 (R;US)
Human Factors
Application of SLIM-MAUD: a test of an interactive computer-based method for organizing expert assessment of human performance and reliability. Volume 1. Main report, 11:29853 (R;US)
Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2, 11:29792 (R;US)
Human Factors Engineering
Nuclear Regulatory Commission Human Factors Program Plan. Revision 2, 11:29848 (R;US)
In-Service Inspection
Human reliability impact on inservice inspection. Review and analysis of human performance in nondestructive testing (emphasizing ultrasonics). Volume 2, 11:29792 (R;US)
Liquid Wastes
Liquid radwaste minimization efforts at Duke Power Company, 11:29367 (RA;US)
Mass
Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Modifications
Handbook for quick cost estimates. A method for developing quick approximate estimates of costs for generic actions for nuclear power plants, 11:29788 (R;US)
Operating Cost
Historical plant cost and annual production expenses for selected electric plants, 1984, 11:29944 (R;US)
Personnel
TSORT - an automated tool for allocating tasks to training strategies, 11:29791 (R;US)
Power Generation
Licensed operating reactors. Status summary report, data as of February 28, 1986. Volume 10, No. 3, 11:29789 (R;US)
Pressure Vessels
Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)

Quality Assurance
Nuclear regulation. Oversight of quality assurance at nuclear power plants needs improvement, 11:29787 (R;US)
Radioactive Waste Facilities
Mobile solidification system interface design considerations, 11:29369 (RA;US)
Modification of an existing radwaste facility to provide onsite low level waste storage, 11:29368 (RA;US)
Project management of radwaste retrofits, 11:29810 (RA;US)
Radioactive Waste Processing
Radwaste ion-exchange optimization, 11:29392 (RA;US)
Reactor Control Systems
State and data techniques for control of discontinuous systems, 11:29809 (R;US)
Reactor Cooling Systems
Review of the OECD specialist meeting on continuous monitoring techniques for assuring coolant circuit integrity, 11:29870 (J;US)
Reactor Instrumentation
Qualification testing evaluation (QTE) program, FIN A-1051, Case 0686. Bimonthly status report, February-March 1986, 11:29797 (R;US)
Reactor Maintenance
Recommendations to the NRC on human engineering guidelines for nuclear power plant maintainability, 11:29852 (R;US)
Reactor Materials
Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)
Reactor Operation
Investigation of the contributors to wrong unit or wrong train events, 11:29849 (R;US)
Licensed operating reactors. Status summary report, data as of February 28, 1986. Volume 10, No. 3, 11:29789 (R;US)
Reactor Operators
Advanced German Operator Support Systems, 11:29871 (J;US)
Reactor Protection Systems
Seismic and dynamic qualification of safety related electrical and mechanical equipment, 11:29850 (R;US)
Reactor Safety
Nuclear Safety: technical progress review, April-June 1986. Volume 27, No. 2 , 11:29866 (R;US)
Regulations
Handbook for quick cost estimates. A method for developing quick approximate estimates of costs for generic actions for nuclear power plants, 11:29788 (R;US)
Reliability
Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Research Programs
D.E.R. 84 panorama E.D.F. progress report, 11:29746 (R;FR;In French)
Safety
Safety implications associated with in-plant pressurized gas storage and distribution systems, 11:29872 (J;US)
Solid Wastes
Solid waste minimization at Duke Power Company, 11:29366 (RA;US)
Valves
Evaluation of the Motor-Operated Valve Analysis and Test System (MOVATS) to detect degradation, incorrect adjustments, and other abnormalities in motor-operated valves, 11:29802 (R;US)

NUCLEAR POWER STATIONS
See NUCLEAR POWER PLANTS

NUCLEAR REACTIONS
See also COMPOUND-NUCLEUS REACTIONS
FISSION
HADRON REACTIONS
HEAVY ION FUSION REACTIONS
THERMONUCLEAR REACTIONS
Correlation Functions
Nuclear collision theory with many-body correlations, 1. Formulation, 11:30933 (R;JP)
Hamiltonians
Unified theory of nuclear physics, 11:30935 (R;JP)
Many-Body Problem
Nuclear collision theory with many-body correlations, 1. Formulation, 11:30933 (R;JP)
Mathematical Models
Microcanonical simulation of nuclear disassembly, 11:30937 (R;US)
Statistical Mechanics
Microcanonical simulation of nuclear disassembly, 11:30937 (R;US)

NUCLEAR REACTORS
See REACTORS

NUCLEAR SPIN RESONANCE
See NUCLEAR MAGNETIC RESONANCE

NUCLEAR STRUCTURE
Nuclear structure studies far from the line of beta stability, 11:30930 (R;US)
Hamiltonians
Unified theory of nuclear physics, 11:30935 (R;JP)
Hartree-Fock Method
Construction of local-scale transformed wave functions and its application to ATDHF, 11:30932 (R;XA)
Structure Functions
Unified theory of nuclear physics, 11:30935 (R;JP)
Wave Functions
Construction of local-scale transformed wave functions and its application to ATDHF, 11:30932 (R;XA)

NUCLEAR WASTE POLICY ACTS
Amendments
Public Law 99-240: an act to amend the low-Level Radioactive Waste Policy Amendments Act of 1985. Introduced in the Senate and House of Representatives of the United States of America in Congress assembled, Ninety-Ninth Congress, January 15, 1986, 11:29419 (B;US)

NUCLEAR WASTES
See RADIOACTIVE WASTES

NUCLEAR WEAPONS
Fallout
Local and global deposition of radioactivity: a reassessment, 11:30697 (R;US)
National Defense
Simple ballistic-missile-defense model to help decision makers, 11:30517 (J;US)

NUCLEAR WINTER
Progress in developing the smoke source term for "nuclear winter" studies: major uncertainties, 11:30545 (R;US)

NUCLEON REACTIONS
See also NEUTRON REACTIONS
PROTON REACTIONS
Gamow-Teller Rules
Opening remarks: basic quark considerations, 11:30942 (BA;US)
Inelastic Scattering
Spin observables in nucleon-nucleus scattering, 11:30943 (BA;US)
Quark Model
Opening remarks: basic quark considerations, 11:30942 (BA;US)
Spin Exchange
Spin observables in nucleon-nucleus scattering, 11:30943 (BA;US)

NUCLEON-NUCLEON INTERACTIONS
Partial Waves
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1982-April 30, 1983, 11:30853 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1980-April 30, 1981, 11:30852 (R;US)
Partial wave analysis of π-N, NN, and KN scattering below 2 GeV. Progress report, June 1, 1979-May 31, 1980, 11:30851 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1984-April 30, 1985, 11:30855 (R;US)
Partial wave analyses of hadron scattering below 2 GeV. Progress report, May 1, 1985-April 30, 1986, 11:30856 (R;US)

NUCLEONS
See also NEUTRONS
PROTONS

Weak Particle Decay
Nucleon decay experiment at Kolar Gold Field, 11:30832 (RA;JP)
NUCLIDES
See ISOTOPES
NUTRIENTS
Ecological Concentration
Control of productivity and population characteristics in aquatic communities. Progress report, 1 September 1982-31 August 1983, 11:30594 (R;US)
NUTS (MECHANICAL)
See FASTENERS

O

O CODES
Version of ORIGEN2 with automated sensitivity-calculation capability, 11:29398 (R;US)
OAK RIDGE
Environment
Environmental surveillance of the Oak Ridge Reservation and surrounding environs during 1985, 11:30584 (R;US)
Radioactivity
Environmental surveillance of the Oak Ridge Reservation and surrounding environs during 1985, 11:30584 (R;US)
Radioecology
Environmental surveillance of the Oak Ridge Reservation and surrounding environs during 1985, 11:30584 (R;US)
OAK RIDGE NATIONAL LABORATORY
See ORNL
OAK RIDGE RESEARCH REACTOR
See ORR REACTOR
OAK RIDGE RESERVATION
Radioactive Waste Facilities
Development of the Central Waste Disposal Facility, 11:29341 (RA;US)
Terrestrial Ecosystems
Long-term ecological study in the Oak Ridge area. III. The oribatid mite fauna in pine litter, 11:30577 (J;US)
OCONEE-1 REACTOR
Oconee, South Carolina, USA
Control Systems
Assessment of the safety implications of control at the Oconee 1 nuclear plant. Final report, 11:29854 (R;US)
PWR hybrid computer model for assessing the safety implications of control systems, 11:29858 (R;US)
Reactor Operation
Assessment of the safety implications of control at the Oconee 1 nuclear plant. Final report, 11:29854 (R;US)
Reactor Safety
PWR hybrid computer model for assessing the safety implications of control systems, 11:29858 (R;US)
OCTADECANOIC ACID
Acoustic ESR
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
OCTUPOLES
Demonstration Programs
Overview of the Fusion Power Demonstration study, 11:31129 (J;US)
Design
Octopole design concepts for the mirror end cell, 11:31184 (J;US)
Overview of the Fusion Power Demonstration study, 11:31129 (J;US)
ODOCOILEUS
See DEER
ODOR
Monitoring
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
OFF-GAS SYSTEMS
Design
Studies of the volatility of cesium and iodine, 11:30189 (RA;US)
OFFICE BUILDINGS
Energy Conservation
Analysis of energy conservation standards for Singapore office buildings, 11:29978 (RA;US)
Analysis of energy conservation standards for Singapore office buildings, 11:30020 (J;GB)
Improving energy performance in office buildings: institutional behavior, 11:29977 (RA;US)
Measures for energy conservation in buildings: Singapore experience, 11:30011 (RA;US)
Energy Consumption
Analysis of energy conservation standards for Singapore office buildings, 11:29978 (RA;US)
Improving energy performance in office buildings: institutional behavior, 11:29977 (RA;US)
Solar Cooling Systems
Evaluation of SOLERAS solar cooling applications: a building case study and findings, 11:29593 (RA;US)
OIL RESIDUES
See PETROLEUM RESIDUES
OIL SHALE DEPOSITS
Geochemical Surveys
Fluorine in Colorado oil shale, 11:29276 (BA;US)
Oil shale grade variability in close-spaced core holes in the Mahogany zone of the Colony Shale Oil Project area, 11:29257 (BA;US)
Geologic Surveys
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
Hydrology
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Lineaments
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Lithology
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Resource Assessment
Review of oil shale research in Australia, 11:29939 (BA;US)
Rock-Fluid Interactions
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
OIL SHALE INDUSTRY
Historical Aspects
The history and future of China's oil shale industry, 11:29940 (BA;US)
OIL SHALE MINING
Blast Effects
Dust and pressure generated during commercial oil shale mine blasting, 11:29260 (BA;US)
Dusts
Fire hazards of oil shale dust layers on hot surfaces, 11:29278 (BA;US)
Economics
Mining strategy effects on oil shale profitability, 11:29261 (BA;US)
Environmental Impacts
Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
Fire Hazards
Fire hazards of oil shale dust layers on hot surfaces, 11:29278 (BA;US)

Mining Engineering
Mining strategy effects on oil shale profitability, 11:29261 (BA;US)
OIL SHALE PROCESSING PLANTS
Design
Estimating solid wastes from oil shale facilities, 11:29283 (BA;US)
Update on the American Syn-Crude/Indiana Shale Oil Project, 11:29272 (BA;US)
Waste Management
Estimating solid wastes from oil shale facilities, 11:29283 (BA;US)
OIL SHALE WASTE WATER
See OIL SHALES
WASTE WATER
OIL SHALES
See also BLACK SHALES
Chemical Analysis
Fluorine in Colorado oil shale, 11:29276 (BA;US)
Chemical Composition
An evaluation of the effects of weathering on a 50-year old retorted oil-shale waste pile, Rulison Experimental Retort, Colorado, 11:29287 (BA;US)
Erosion
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Explosive Fracturing
Dust and pressure generated during commercial oil shale mine blasting, 11:29260 (BA;US)
Evaluation of blast designs for in situ oil shale retorting, 11:29262 (BA;US)
Limitations of commercial explosives and blasting caps and their effect on in situ blast design, 11:29263 (BA;US)
Rock motion modeling of oil shale cratering experiments, 11:29264 (BA;US)
Fischer Assay
Oil shale grade variability in close-spaced core holes in the Mahogany zone of the Colony Shale Oil Project area, 11:29257 (BA;US)
In-Situ Retorting
A method for estimating permeability in oil shale retorts based on pressure and temperature measurements, 11:29266 (BA;US)
Alkaline scrubbing of in situ oil shale retort offgas at Geokinetics, 11:29279 (BA;US)
Limitations of commercial explosives and blasting caps and their effect on in situ blast design, 11:29263 (BA;US)
Pressure loss in packed beds of low void fraction, 11:29267 (BA;US)
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)
Meetings
Eighteenth oil shale symposium, 11:29254 (B;US)
Modified In-Situ Processes
Evaluation of blast designs for in situ oil shale retorting, 11:29262 (BA;US)
Rock motion modeling of oil shale cratering experiments, 11:29264 (BA;US)
Pyrolysis
Laboratory studies of the kinetics at high temperature pyrolysis of shale. Final report, 11:29275 (R;SE;In Swedish)
Pyrolysis of oil shale in supercritical toluene reaction mechanism and role of hydrogen, 11:29271 (BA;US)
Research Programs
EPA oil shale research activities, 11:29255 (BA;US)
Review of oil shale research in Australia, 11:29939 (BA;US)
Retorting
A new oil shale retort fluid beds exchanging solids but not gases, 11:29270 (BA;US)
Initial results of Green River Oil Shale Processing using the University of Utah's pilot scale bottom burning retort, 11:29269 (BA;US)
Results of mathematical modeling of oil shale retorting in an aboveground, external-combustion, moving-bed retort, 11:29268 (BA;US)
Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort, 11:29281 (BA;US)
OIL WELLS
Carbon Dioxide Injection
Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Waterflooding
Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)
OILS
See also COAL TAR OILS
FUEL OILS
Chemical Composition
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report (Synthetic oil), 11:29236 (R;US)
Phase Diagrams
Improvement of CO_2 flood performance. Annual report (Synthetic oil), 11:29236 (R;US)
Phase Studies
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report (Synthetic oil), 11:29236 (R;US)
OLEFINS
See ALKENES
OMAN
Energy Policy
Oman - energy situation 1984, 11:29934 (R;DE;In German)
Energy Supplies
Oman - energy situation 1984, 11:29934 (R;DE;In German)
ON-LINE COMPUTERS
See COMPUTERS
ON-LINE SYSTEMS
ON-LINE SYSTEMS
Manuals
Computing Services Software Library, 11:31293 (R;US)
OPERATION (REACTOR)
See REACTOR OPERATION
OPTICAL SPECTROMETERS
Amplification
Raman accumulator as fusion laser driver, 11:30504 (P;US)
Compression
Raman accumulator as fusion laser driver, 11:30504 (P;US)
Modifications
Modification of a commercially available ICP for application to radioactive analyses, 11:30506 (J;US)
Pulse Shapers
Raman accumulator as fusion laser driver, 11:30504 (P;US)
OPTICAL SYSTEMS
Coatings
Coatings for high energy applications. The Nova laser, 11:31083 (R;US)
Design
Scattering apodizer for laser beams, 11:30366 (P;US)
ORANGE-TYPE SPECTROMETERS
See FLAT MAGNETIC SPECTROMETERS
OREGON
Remedial Action
Geologic considerations in UMTRA Project alternate site selection process, 11:29325 (RA;US)
ORGANIC BROMINE COMPOUNDS
See also BROMINATED AROMATIC HYDROCARBONS
Chemical Preparation
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)_2X$ salts (X = ICl_2 and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Crystal Structure
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)_2X$ salts (X = ICl_2 and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Electron Spin Resonance
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)_2X$ salts (X = ICl_2 and

$BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Electronic Structure

New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)^{2}X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Reduction

Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex, 11:30246 (J;US)

Mechanistic investigation of carbon-carbon bond formation in the reduction of alkyl halides by organonickel complexes in aqueous solution (R'X (R' = CH_3, C_2H_5, 1-C $_3H_7$, 2-C_3H_7, and $PhCH_2$; X = Cl, Br, I) $RNi(tmc)^+$ (R = C_2H_5, C_3H_7, and CH_2-c-C_6H_9; tmc = (1R,4R,8S,11S)-1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane)), 11:30247 (J;US)

X-Ray Diffraction

New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)^{2}X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

ORGANIC CHLORINE COMPOUNDS

See also CHLORINATED AROMATIC HYDROCARBONS
METHYLENE CHLORIDE

Cations

Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)

Chemical Preparation

New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)^{2}X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Chemical Reactions

Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)

Crystal Structure

New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)^{2}X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Dissociation

Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)

Electron Spin Resonance

New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)^{2}X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Electron Transfer

Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)

Electronic Structure

New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)^{2}X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Energy Absorption

Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)

Oxidation

Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals, 11:30286 (J;US)

Photolysis

Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals, 11:30286 (J;US)

Radicals

Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)

Reduction

Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex, 11:30246 (J;US)

Mechanistic investigation of carbon-carbon bond formation in the reduction of alkyl halides by organonickel complexes in aqueous solution (R'X (R' = CH_3, C_2H_5, 1-C $_3H_7$, 2-C_3H_7, and $PhCH_2$; X = Cl, Br, I) $RNi(tmc)^+$ (R = C_2H_5, C_3H_7, and CH_2-c-C_6H_9; tmc = (1R,4R,8S,11S)-1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane)), 11:30247 (J;US)

X-Ray Diffraction

New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)^{2}X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

ORGANIC COMPOUNDS

See also ALDEHYDES
AMINES
AROMATICS
CARBOHYDRATES
HETEROCYCLIC COMPOUNDS
HYDROCARBONS
HYDROXY COMPOUNDS
KETONES
ORGANIC HALOGEN COMPOUNDS
ORGANIC NITROGEN COMPOUNDS
ORGANIC OXYGEN COMPOUNDS
ORGANIC PHOSPHORUS COMPOUNDS
ORGANIC POLYMERS
ORGANIC SILICON COMPOUNDS
ORGANIC SULFUR COMPOUNDS
ORGANOMETALLIC COMPOUNDS
PROTEINS
STEROIDS

Adsorption

The effect of residual carbon on adsorption of organic compounds by retorted oil shale, 11:29285 (BA;US)

Charge Exchange

Charge and spin density waves in charge-transfer solids, 11:30269 (J;GB)

Chemical Preparation

C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes, 11:30318 (J;US)

Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$, 11:30317 (J;US)

Preparation and characterization of the first organoactinide polysulfide (eta^5-$C_5Me_5)_2ThS_5$. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)

Synthesis and X-ray structure of $(C_5Me_5)_2Th(\mu$-$PPh_2)_2Pt(PMe_3)$: a complex with a thorium-platinum bond, 11:30316 (J;US)

Chemical Properties

Preparation and characterization of the first organoactinide polysulfide (eta^5-$C_5Me_5)_2ThS_5$. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)

Chemical Reactions

C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes, 11:30318 (J;US)

Crystal Structure

Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$, 11:30317 (J;US)

Preparation and characterization of the first organoactinide polysulfide (eta^5-$C_5Me_5)_2ThS_5$. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)

Structure of trichloro(diethylenetriamine)gold(II), $Au(dien)Cl_2$, determined by single-crystal x-ray diffraction, Raman, and EXAFS spectroscopies: an EXAFS caveat, 11:30254 (J;US)

Synthesis and X-ray structure of $(C_5Me_5)_2Th(\mu$-$PPh_2)_2Pt(PMe_3)$: a complex with a thorium-platinum bond, 11:30316 (J;US)

Electronic Structure
C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes, 11:30318 (J;US)
Charge and spin density waves in charge-transfer solids, 11:30269 (J;GB)
Geochemistry
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)
Molecular Structure
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS_5. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)
Radiochemical Analysis
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)

ORGANIC FLUORINE COMPOUNDS
See also FLUOROURACILS
Chemical Preparation
Metal complexes of fluorophosphines. 13. Reaction of fac-(CH_3CN)$_3$Mo(CO)$_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: (CO)$_3$Mo[$^+$-$CH_3N(PF_2)_2$]$_2$(μ-PF_2)(μ-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Chemical Reactions
Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)
Crystal Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-(CH_3CN)$_3$Mo(CO)$_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: (CO)$_3$Mo[$^+$-$CH_3N(PF_2)_2$]$_2$(μ-PF_2)(μ-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Dissociation
Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)
Energy Absorption
Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)
Molecular Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-(CH_3CN)$_3$Mo(CO)$_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: (CO)$_3$Mo[$^+$-$CH_3N(PF_2)_2$]$_2$(μ-PF_2)(μ-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Oxidation
Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals, 11:30286 (J;US)
Photolysis
Flash photolysis of 1,3-dichlorotetrafluoroacetone in the presence of oxygen. Kinetics and mechanism of the oxidation of the chlorodifluoromethyl radicals, 11:30286 (J;US)

ORGANIC HALOGEN COMPOUNDS
See also ORGANIC BROMINE COMPOUNDS
ORGANIC CHLORINE COMPOUNDS
ORGANIC FLUORINE COMPOUNDS
ORGANIC IODINE COMPOUNDS
Chemical Reaction Kinetics
Temperature effects on rates of dehalogenation of aromatic anion radicals, 11:30258 (J;US)
Dissociation
Temperature effects on rates of dehalogenation of aromatic anion radicals, 11:30258 (J;US)

ORGANIC IODINE COMPOUNDS
Chemical Preparation
Design, synthesis and evaluation of redox radiopharmaceuticals: a potential new approach for the development of brain imaging agents, 11:30651 (R;US)
Design, synthesis and evaluation of 2-deoxy-2-iodovinyl-branched carbohydrates as potential brain imaging agents, 11:30652 (R;US)
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)$_2$X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Chemical Radiation Effects
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Crystal Structure
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)$_2$X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Electron Spin Resonance
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)$_2$X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Electronic Structure
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)$_2$X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Reduction
Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex, 11:30246 (J;US)
Mechanistic investigation of carbon-carbon bond formation in the reduction of alkyl halides by organonickel complexes in aqueous solution (R'X (R' = CH_3, C_6H_5, 1-C_3H_7, 2-C_3H_7, and $PhCH_2$; X = Cl, Br, I) RNi(tmc)$^+$ (R = C_6H_5, C_6H_7, and CH_2-c-C_6H_9; tmc = (1R,4R,8S,11S)-1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane)), 11:30247 (J;US)
Tissue Distribution
Design, synthesis and evaluation of 2-deoxy-2-iodovinyl-branched carbohydrates as potential brain imaging agents, 11:30652 (R;US)
X-Ray Diffraction
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-(ET)$_2$X salts (X = $ICl_2\pi$ and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

ORGANIC ION EXCHANGERS
Radiolysis
Degradation of resins in EPICOR-II prefilters from Three Mile Island, 11:30154 (RA;US)

ORGANIC NITROGEN COMPOUNDS
Excluding PROTEINS, AMINES, ALKALOIDS, AMINO ACIDS, NUCLEIC ACIDS, and NUCLEOTIDES.
See also AMIDES
CARBAMATES
NITRO COMPOUNDS
NITROSO COMPOUNDS
PORPHYRINS
Chemical Preparation
Metal complexes of fluorophosphines. 13. Reaction of fac-(CH_3CN)$_3$Mo(CO)$_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: (CO)$_3$Mo[$^+$-$CH_3N(PF_2)_2$]$_2$(μ-PF_2)(μ-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Chemical Reaction Kinetics
Temperature effects on rates of dehalogenation of aromatic anion radicals, 11:30258 (J;US)
Crystal Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-(CH_3CN)$_3$Mo(CO)$_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom:

$(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)

Dissociation
Temperature effects on rates of dehalogenation of aromatic anion radicals, 11:30258 (J;US)

Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)

Molecular Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)

ORGANIC OXYGEN COMPOUNDS
Excluding HYDROXY COMPOUNDS, CARBONIC ACID DERIVATIVES, LIPIDS, STEROIDS, CARBOHYDRATES, ORGANIC ACIDS, ALDEHYDES, KETONES and ESTERS.
See also EPOXIDES
ETHERS
FURANS
QUINONES

Electronic Structure
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)

Excited States
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)

Normal-Mode Analysis
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)

Pyrolysis
Fourier transform infrared spectroscopic study of the thermal stability of peroxyacetyl nitrate, 11:30256 (J;US)

Structural Chemical Analysis
Small-angle neutron-scattering study of alkyl polyoxyethylene sulfate micelles. Effect of the number of polyoxyethylene groups on n-dodecyl polyoxyethylene sulfate in D_2O/H_2O mixtures at 25°C, 11:30263 (J;US)

ORGANIC PHOSPHORUS COMPOUNDS
Excluding NUCLEIC ACIDS and NUCLEOTIDES.
See also TOPO

Chemical Preparation
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)

Chemical Reactions
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)

ORGANIC POLYMERS
See also POLYETHYLENE GLYCOLS
RESINS

Solubility
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)

Viscosity
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)

ORGANIC SILICON COMPOUNDS
See also SILOXANES

Thermal Diffusion
Mound activities in chemical and physical research: July-December 1985, 11:30196 (R;US)

ORGANIC SULFUR COMPOUNDS
See also SULFONIC ACIDS
THIOCYANATES

Chemical Preparation
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)^2X$ salts (X = ICl_2^- and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)

Crystal Structure
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)^2X$ salts (X = ICl_2^- and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)

Electron Spin Resonance
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)^2X$ salts (X = ICl_2^- and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Electronic Structure
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)^2X$ salts (X = ICl_2^- and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

Molecular Structure
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)

Solubility
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986 (Thioxanthone, dibenzothiophene), 11:29161 (R;US)

X-Ray Diffraction
New cation-anion interaction motifs, electronic band structure, and electrical behavior in β-$(ET)^2X$ salts (X = ICl_2^- and $BrICl^-$) (β-bis(ethylenedithio)tetrathiafulvalene), 11:30245 (J;US)

ORGANOMETALLIC COMPOUNDS
For compounds of metals and semimetals with organic compounds, but only when the metal or semimetal is directly bound to carbon.

Activation Energy
Reactions of metal ions and their clusters in the gas phase using laser ionization: ion cyclotron resonance spectroscopy. Progress report, July 1, 1985-June 30, 1986, 11:30235 (R;US)

Catalytic Effects
Mechanistic investigation of carbon-carbon bond formation in the reduction of alkyl halides by organonickel complexes in aqueous solution (R'X (R' = CH_3, C_2H_5, 1-C_3H_7, 2-C_3H_7, and $PhCH_3$; X = Cl, Br, I) $RNi(tmc)^+$ (R = C_2H_5, C_6H_7, and CH_3-c-C_6H_9; tmc = (1R,4R,8S,11S)-1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane)), 11:30247 (J;US)

Cations
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)

Chemical Preparation
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)

Chemical Reaction Kinetics
Reactions of metal ions and their clusters in the gas phase using laser ionization: ion cyclotron resonance spectroscopy. Progress report, July 1, 1985-June 30, 1986, 11:30235 (R;US)

Chemical Reactions
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)

Crystal Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom:

$(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
Detection
Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system, 11:30224 (J;GB)
Electron Transfer
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)a/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Electronic Structure
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Excited States
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Molecular Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-Cl)Mo(CO)(PF_2NHCH_3), 11:30231 (J;US)
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
Normal-Mode Analysis
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Oxidation
Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex $(Ni(IR, 4R 8S, 11S - tmc)^+$; tmc = 1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane; and R = CH_3, C_2H_5, C_3H_7, or $CH_3CH(CH_3)_3$ CH_2 + c-$C_6H_9CH_3$), 11:30246 (J;US)
Photochemical Reactions
Photoreduction of benzophenone by amino acids, aminopolycarboxylic acids and their metal complexes: a laser-flash-photolysis study, 11:30296 (J;GB)
Photolysis
Laser flash photolytic determination of triplet yields via singlet oxygen generation, 11:30297 (J;CH)
Radicals
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)a/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Synthesis
Selective transformation of carbonyl ligands to organic molecules. Progress report, September 1, 1983-August 31, 1986, 11:30236 (R;US)

ORGANS
See also BONE MARROW
KIDNEYS
LUNGS
SKELETON
Magnetic Fields
Biological effects of stationary magnetic fields, 11:30733 (BA;US)

ORNL
Radioactive Waste Disposal
Monitoring of surface deformation and microseismicity applied to radioactive waste disposal through hydraulic fracturing at Oak Ridge National Laboratory, 11:29376 (RA;US)
Recent hydrofracture operations at Oak Ridge National Laboratory, 11:29374 (RA;US)

ORNL RESEARCH REACTOR
See ORR REACTOR

ORR REACTOR
Neutron Flux
Neutronics calculations in support of the ORR-MFE-4A and -4B spectral tailoring experiments, 11:31043 (RA;US)
Reactor Control Systems
Description of a research reactor control system using a programmable controller, 11:29817 (R;US)
Reactor Physics
Computational methodology for the Oak Ridge Research Reactor (ORR) and Bulk Shielding Reactor (BSR): the VICTORR input processing code for the BOLD VENTURE system. Volume 2, 11:29821 (R;US)

ORSAY TANDEM ACCELERATOR
Modifications
Radial injection in the Orsay cryogenic cyclotron project, 11:30408 (R;FR;In French)

OSCILLATIONS (PLASMA)
See PLASMA WAVES

OSMIUM COMPLEXES
Cations
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)a/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Electron Transfer
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)a/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Powders
Zero-field NMR of solid bis(μ-hydrido)decacarbonyltriosmium, 11:30203 (J;US)
Radicals
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)a/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Structural Chemical Analysis
Anorganic chemistry, 11:30191 (RA;ZA;In Afrikaans)

OUTER CONTINENTAL SHELF
See CONTINENTAL SHELF

OXALATES
Decomposition
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Oxidation
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Radiolysis
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)
Reduction
Pulse-radiolysis study of mixed-valence Mo/sup IV,V/ complexes of EDTA, L-cysteine, and oxalate, 11:30303 (J;US)

OXALIC ACID
Leaching
Release of organic reagents from solidified decontamination wastes, 11:29433 (RA;US)

OXETANE
See ETHERS

OXIDASES
See OXIDOREDUCTASES

OXIDES
See also ALUMINIUM OXIDES
CALCIUM OXIDES
CHLORINE OXIDES
CHROMIUM OXIDES
COBALT OXIDES
COPPER OXIDES
INDIUM OXIDES
IRON OXIDES

LITHIUM OXIDES
MAGNESIUM OXIDES
NICKEL OXIDES
NIOBIUM OXIDES
NITROGEN OXIDES
PHOSPHORUS OXIDES
PLUTONIUM OXIDES
PRASEODYMIUM OXIDES
RHODIUM OXIDES
SILICON OXIDES
SODIUM OXIDES
SULFUR OXIDES
TITANIUM OXIDES
VANADIUM OXIDES
ZINC OXIDES
ZIRCONIUM OXIDES

Chemical Preparation
Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)

Chemical Reaction Yield
Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene, 11:30287 (J;US)

Isomerization
Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)

Labelling
Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)

OXIDOREDUCTASES
Code number 1.
See also OXYGENASES

Enzyme Activity
Studies on the nitrate reductase activities of the fruit and the source leaf in pepper, 11:30641 (J;US)

OXIRANS
See EPOXIDES

OXOPROPANE
See ACETONE

OXYGEN

Adsorption
Kinetics of CO oxidation over Ru(0001), 11:30201 (J;US)

Biological Effects
Ethylene and the growth of rice seedlings, 11:30676 (J;US)

Chemical Explosions
Gas explosion characterization, wave propagation (small-scale experiments). Vol. 1, 11:30509 (R;FR)
Gas explosion characterization, wave propagation (half-scale experiments). Vol. 2, 11:30510 (R;FR)

Chemical Reaction Kinetics
Dynamical studies of molecular systems. Final progress report, February 1, 1985-January 31, 1986, 11:30194 (R;US)

Chemisorption
Active sites in char gasification. Quarterly technical progress report, 1 January-31 March 1986, 11:29160 (R;US)

Ecological Concentration
Oxygen depletion in the New York apex: causes and consequences, 11:30613 (J;US)

Excited States
Laser flash photolytic determination of triplet yields via singlet oxygen generation, 11:30297 (J;CH)

Photolysis
Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene, 11:30287 (J;US)

Resonance Fluorescence
Branching ratio for the hydrogen atom product channel in the reaction of ground-state atomic oxygen with ethylene, 11:30287 (J;US)

Thermochemical Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

Yields
Long-term endurance and selection studies in hydrogen and oxygen photoproduction by Chlamydomonas reinhardtii, 11:29457 (J;GB)

OXYGEN 16 REACTIONS

Cluster Model
Alpha-clustering in 75 MeV $^{16}O+^{40}Ca$ as a collective mass fragmentation process, 11:30908 (R;XA)

Heavy Ion Fusion Reactions
Alpha-clustering in 75 MeV $^{16}O+^{40}Ca$ as a collective mass fragmentation process, 11:30908 (R;XA)

Total Cross Sections
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)

OXYGEN 18

Diffusion
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)

Isotope Effects
Diffusion mechanisms in transition-metal oxides, 11:30137 (J;US)

Labelled Compounds
Synthesis of oxygen-18 enriched phenol and naphthol from $^{18}O_2$, 11:30278 (J;GB)

OXYGEN 18 REACTIONS

Transfer Reactions
Study of some direct reactions at 0° in $^{18}O+^{26}Mg$ and $^{18}O+^{12}C$ systems, 11:30897 (R;FR;In French)

OXYGEN COMPOUNDS
See also BORATES
HAFNATES
HYDROXIDES
NIOBATES
NITRATES
OXIDES
PERCHLORATES
PEROXIDES
SULFATES
TANTALATES
WATER
ZIRCONATES

Activation Energy
Reactions of HO_3 and O_3^- with iodine and bromine and the I_3^- and I atom reduction potentials, 11:30202 (J;US)

Chemical Reaction Kinetics
Reactions of HO_3 and O_3^- with iodine and bromine and the I_3^- and I atom reduction potentials, 11:30202 (J;US)

Chemical Reactions
Theoretical studies of the energetics and mechanisms of chemical reactions: abstraction reactions, 11:30206 (J;US)

Crystal-Phase Transformations
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)

Formation Free Energy
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)

Free Energy
Reactions of HO_3 and O_3^- with iodine and bromine and the I_3^- and I atom reduction potentials, 11:30202 (J;US)

Molecular Structure
Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON, 11:30211 (J;US)

Normal-Mode Analysis
Ab initio molecular orbital calculation and semiempirical analysis of the vibrational frequencies and force constants of ONF and FON, 11:30211 (J;US)

Specific Heat
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)

Stability
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)

OXYGEN EFFECT (RADIOBIOLOGY)
See OXYGEN

OXYGEN HYDRIDES
See WATER

OXYGEN ISOTOPES
See also OXYGEN 18

Isotope Ratio
Microwave limb sounder for stratospheric measurements, 11:30181 (R;US)

OXYGEN LOGS
See NEUTRON-GAMMA LOGGING

OXYGENASES
Code number 1.13

Enzyme Activity
2-(4-bromoacetamido)anilino-2-deoxypentitol 1,5-bisphosphate, a new affinity label for ribulose bisphosphate carboxylase/oxygenase from Rhodospirillum rubrum: determination of reaction parameters and characterization of an active site peptide, 11:30638 (J;US)
Labelling
2-(4-bromoacetamido)anilino-2-deoxypentitol 1,5-bisphosphate, a new affinity label for ribulose bisphosphate carboxylase/oxygenase from Rhodospirillum rubrum: determination of reaction parameters and characterization of an active site peptide, 11:30638 (J;US)

OZONE
Air Pollution Monitoring
Ozone measurements near the ground and in the atmosphere in the first half-year 1985, 11:30541 (R;DE;In German and English)
Chemical Reaction Kinetics
Photochemical method for radioiodine abatement, 11:29311 (R;CA)
Ecological Concentration
Relative humidity: important modifier of pollutant uptake by plants, 11:30555 (J;US)
Foliar Uptake
Relative humidity: important modifier of pollutant uptake by plants, 11:30555 (J;US)
Measuring Methods
Constructing a coherent long-term global total ozone climatology from the BUV, MFR, and SBUV/TOMS data sets, 11:30810 (R;US)
Monitoring
Airborne Lidar measurements of aerosols, mixed layer heights, and ozone during the 1980 PEPE/NEROS summer field experiment, 11:30538 (R;US)

P

PACIFIC NORTHWEST LABORATORIES
See BATTELLE PACIFIC NORTHWEST LABORATORIES
PACIFIC NORTHWEST REGION
See FEDERAL REGION X
PACKAGING
Impact Tests
Development of a large unyielding target for packaging tests, 11:30348 (R;US)
Quality Assurance
Analysis of maintenance and quality assurance measures for the different radioactive materials packagings in the member states of the European Community, 11:30338 (R;FR;In French)
PACKED BED
Performance
Experiment to determine properties of packed particle beds and regenerators at cryogenic temperatures, 11:30360 (J;US)
Pressure Drop
Pressure loss in packed beds of low void fraction, 11:29267 (BA;US)
PAH
See POLYCYCLIC AROMATIC HYDROCARBONS
PALLADIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
PALMITIC ACID
See HEXADECANOIC ACID
PALO DURO BASIN
Aquifers
Geostatistical analysis of potentiometric data in Wolfcamp aquifer of the Palo Duro Basin, Texas, 11:30739 (R;US)
PALO VERDE-2 REACTOR
Wintersburg, Arizona
Reactor Components
Technical specifications, Palo Verde Nuclear Generating Station, Unit No. 2 (Docket No. 50-529). Appendix A to License No. NPF-51, 11:29773 (R;US)
Reactor Instrumentation
Technical specifications, Palo Verde Nuclear Generating Station, Unit No. 2 (Docket No. 50-529). Appendix A to License No. NPF-51, 11:29773 (R;US)
Reactor Operation
Technical specifications, Palo Verde Nuclear Generating Station, Unit No. 2 (Docket No. 50-529). Appendix A to License No. NPF-51, 11:29773 (R;US)
Specifications
Technical specifications, Palo Verde Nuclear Generating Station, Unit No. 2 (Docket No. 50-529). Appendix A to License No. NPF-51, 11:29773 (R;US)
PANAMA
Resource Development
Geothermal activities in Central America, 11:29981 (RA;US)
PAPER INDUSTRY
Energy Consumption
Energy consumption variations in pulp and paper industry, 11:30029 (R;FI;In Finnish)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report, 11:29980 (R;US)
Heat Pumps
Vapour recompression evaporation of black liqour, 11:30026 (R;FI;In Finnish)
Waste Heat Utilization
Vapour recompression evaporation of black liqour, 11:30026 (R;FI;In Finnish)
PARABANIC ACID
See ORGANIC OXYGEN COMPOUNDS
PARABOLIC DISH COLLECTORS
Performance Testing
Parabolic dish module experiment. Final test report, 11:29607 (R;US)
PARABOLIC DISH REFLECTORS
Design
Innovative point-focus concentrator projects, 11:29608 (R;US)
Research Programs
Innovative point-focus concentrator projects, 11:29608 (R;US)
PARABOLIC POINT COLLECTORS
See PARABOLIC DISH COLLECTORS
PARAFFINS
See ALKANES
PARALLEL PROCESSING
Multiprocessor sparse L/U decomposition with controlled fill-in. Final report, 11:31280 (R;US)
Algorithms
Practical paradigm for parallel processing problems, 11:31284 (R;US)
Array Processors
Algorithms + Alchemy = Architectures, 11:31290 (BA;US)
Optimization
Partitioning problems in parallel, pipelined and distributed computing. Final Report, 11:31282 (R;US)
Research Programs
Research in computer science. semiannual report, 11:31283 (R;US)
PARAMAGNETIC RESONANCE (ELECTRON)
See ELECTRON SPIN RESONANCE
PARAMAGNETIC RESONANCE (NUCLEAR)
See NUCLEAR MAGNETIC RESONANCE
PARTICLE BEAM FUSION ACCELERATOR
Bremsstrahlung
Bremsstrahlung shielding analysis of the particle beam fusion accelerator PBFA II, 11:31220 (J;US)
Inertial Confinement
Status of PBFA II for Inertial Confinement Fusion with light ions, 11:31218 (J;US)

Ion Beam Targets
Status of PBFA II for Inertial Confinement Fusion with light ions, 11:31218 (J;US)
Plasma Diagnostics
Bremsstrahlung shielding analysis of the particle beam fusion accelerator PBFA II, 11:31220 (J;US)
Shielding
Bremsstrahlung shielding analysis of the particle beam fusion accelerator PBFA II, 11:31220 (J;US)
Improved shielding calculations for the particle beam fusion accelerator PBFA II, 11:31080 (R;US)
PARTICLE MODELS
See also JET MODEL
UNIFIED GAUGE MODELS
Low-energy hadron physics in the virton quark model, 11:30857 (R;XA)
PARTICLE-BEAM WEAPONS
See DIRECTED-ENERGY WEAPONS
PARTICLES
When appropriate use more specific terms listed under CHARGED PARTICLES, ELEMENTARY PARTICLES, and QUASI PARTICLES.
See also PARTICULATES
Light Scattering
Single scattering from nonspherical Chebyshev particles: a compendium of calculations, 11:30888 (R;US)
PARTICULATES
Prior to September 1981, this concept was indexed to PARTICLES and AEROSOLS.
Air Pollution Control
Economics of electrostatic precipitators and fabric filters, 11:29689 (RA;US)
Evaluation of an air curtain secondary hooding system, 11:30531 (RA;US)
Evaluation of street sweeping as a means of controlling urban particulate, 11:30534 (RA;US)
Feasibility of using parameter monitoring as an aid in determining continuing compliance of particulate control devices, 11:29741 (RA;US)
High-temperature, high-pressure electrostatic precipitation, current status, 11:29685 (RA;US)
Hot-gas fabric filtration 500°F-1500°F - no Utopia but reality, 11:29695 (RA;US)
Impact of coming particulate control requirements on the utility industry, 11:30565 (RA;US)
Impact of coming particulate control requirements on the iron and steel industry, 11:30566 (RA;US)
Impact of proposed acid rain legislation on power plant particulate control equipment, 11:29692 (RA;US)
Microcomputer programs for precipitator performance estimates, 11:29696 (RA;US)
Microcomputer models for particulate control, 11:29691 (RA;US)
Optimizing the performance of a modern electrostatic precipitator by design refinements, 11:29742 (RA;US)
Particle charging with an electron beam precharger, 11:29693 (RA;US)
Pilot demonstration of air curtain control of buoyant fugitive emissions, 11:30529 (RA;US)
Power plant plume opacity control, 11:29704 (RA;US)
Prediction of plume opacity from stationary sources, 11:30528 (RA;US)
Technical manual on hood capture systems to control process fugitive particulate emissions, 11:29728 (RA;US)
Technical manual on the identification, assessment, and control of fugitive emissions, 11:30532 (RA;US)
Update of the performance of the Cromby Station fabric filter, 11:29737 (RA;US)
Air Pollution Monitoring
Characterization of fugitive particulate emissions from industrial sites, 11:30530 (RA;US)
Evaluation of street sweeping as a means of controlling urban particulate, 11:30534 (RA;US)
Deposition
Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)
Ecological Concentration
Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
Characterization of fugitive particulate emissions from industrial sites, 11:30530 (RA;US)
Electric Charges
Charging of particulates by evaporating charged water droplets, 11:29694 (RA;US)
Emission
Size fractionation of black and organic particulate carbon from fires. Final report, 11:30537 (R;US)
Environmental Transport
Assessing environmental effects of oil-fuelled energy systems, 11:30527 (R;IT)
Physical Properties
Measurement of the electrokinetic transport properties of particles in an electrostatic precipitator, 11:29744 (RA;US)
Pollution Regulations
Future particulate regulations: the view of the small manufacturer, 11:30568 (RA;US)
Impact of coming particulate control requirements on the utility industry, 11:30565 (RA;US)
Impact of coming particulate control requirements on the iron and steel industry, 11:30566 (RA;US)
Impact of particulate control requirements: large manufacturer's viewpoint, 11:30567 (RA;US)
Regulatory framework for future particulate technology needs, 11:30564 (RA;US)
Pollution Sources
Role of inhalation studies with animals in defining human health risks for vehicle and power plant emissions, 11:29227 (J;US)
Removal
Comparison of US and Japanese practices in the specification and operation and maintenance of electrostatic precipitators, 11:29735 (RA;US)
Removal of sulfur dioxide and particulate using E-SOX, 11:29733 (RA;US)
Toxicity
Role of inhalation studies with animals in defining human health risks for vehicle and power plant emissions, 11:29227 (J;US)
PASSIVE SOLAR COOLING SYSTEMS
Design
Overview of environmental design methodologies and problems related to passive low energy architecture, 11:29586 (RA;US)
Passive solar design for a high rise housing building in a seismic zone: design development and calculated performance, 11:29594 (RA;US)
Use of geoclimatic data for the determination of building characteristics in the north of the Venezuelan Republic, 11:29598 (RA;US)
Feasibility Studies
Bioclimatic indicators for determining passive and low energy hybrid systems - case study, Saudi Arabia, 11:29585 (RA;US)
Desirable orientation and proportion of courtyards for Riyadh region, 11:29580 (RA;US)
Operation
Integration of passive and active solar strategies in buildings, 11:29568 (RA;US)
Performance
Passive cooling in Mexico, Mexico City, 11:29596 (RA;US)
Passive-hybrid cooling and load avoidance in very hot climates, 11:29584 (RA;US)
Passive solar cooling house at King Faisal University, 11:29574 (RA;US)
Passive solar design for a high rise housing building in a seismic zone: design development and calculated performance, 11:29594 (RA;US)
PASSIVE SOLAR HEATING SYSTEMS
Design
Design tools for passive solar applications, 11:29602 (R;US)
Passive solar heating and analysis, 11:29582 (RA;US)

Financial Assistance
Washington State Solar Bank Program. Special report: interim evaluation of the solar bank program, 11:29606 (R;US)
Grants
Washington State Solar Bank Program. A comprehensive 1984-85 program evaluation, 11:29605 (R;US)
Operation
Integration of passive and active solar strategies in buildings, 11:29568 (RA;US)
Performance
Solar architecture since 1970: passive and low energy innovations, 11:29581 (RA;US)

PATENTS
Use only for items about patents, not for items which are patents.
Bibliographies
Current Energy Patents: a current awareness journal, 11:31274 (J;US)

PAVEMENTS
Surface Treatments
Machine for applying a two component resin to a roadway surface, 11:30022 (P;US)

PBFA
See PARTICLE BEAM FUSION ACCELERATOR

PCB
See CHLORINATED AROMATIC HYDROCARBONS

PEARL SPAR
See DOLOMITE

PEAT
Aerial Surveying
Variation of bulk density in Swedish peat bogs, 11:29203 (R;SE;In Swedish)
Air Pollution Monitoring
Program for measuring the air pollution from burning peat fuels, 11:29200 (R;SE;In Swedish)
Biological Effects
Fertilization with peat and wood ashes - effects on biomass production, nutrient balance and uptake of heavy metals, 11:29547 (R;SE;In Swedish)
Briquetting
Pilot study in producing briquettes from peat, 11:29212 (R;SE;In Swedish)
Bulk Density
Variation of bulk density in Swedish peat bogs, 11:29203 (R;SE;In Swedish)
Combustion
Program for measuring the air pollution from burning peat fuels, 11:29200 (R;SE;In Swedish)
Combustion Properties
Elimination of quality fluctuations of milled peat in transportation phase and cost caused by these fluctuations, 11:29209 (R;FI;In Finnish)
Gasification
Gasification of sod peat in a fixed bed cocurrent gasifier, 11:29169 (R;SE)
Liquefaction
Hydrotreatment studies of Swedish peat products. Progress report No. 3 (Final), 11:29168 (R;SE)
Quality Control
Elimination of quality fluctuations of milled peat in transportation phase and cost caused by these fluctuations, 11:29209 (R;FI;In Finnish)
Transport
Elimination of quality fluctuations of milled peat in transportation phase and cost caused by these fluctuations, 11:29209 (R;FI;In Finnish)
Water Removal
Mechanical dewatering of peat treated with chemicals. Final report, 11:29213 (R;SE;In Swedish)

PEATLANDS
See WETLANDS

PEBBLE BED REACTORS
Thorium Cycle
Closed thorium cycles in the pebble bed HTR, 11:29775 (R;DE)

PEGMATITES
Geologic Fractures
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)
Lithology
Geological survey of the Lac du Bonnet Batholith, Manitoba, 11:29310 (R;CA)

PELLETS (BREEDING)
See BREEDING PELLETS

PENTAERYTHRITOL TETRANITRATE
See PETN

PEOPLE
See HUMAN POPULATIONS

PEOPLES REPUBLIC OF CHINA
See CHINA

PEPTIDES
Purification
2-(4-bromoacetamido)anilino-2-deoxypentitol 1,5-bisphosphate, a new affinity label for ribulose bisphosphate carboxylase/oxygenase from Rhodospirillum rubrum: determination of reaction parameters and characterization of an active site peptide, 11:30638 (J;US)

PERCHLORATES
Solubility
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)
Thermodynamic Properties
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)

PERHYDROXYL RADICAL
See HYDROPEROXY RADICALS

PERIPHYTON
See AUFWUCHS

PERMANENT MAGNETS
Design
Permanent magnet multipole with adjustable strength, 11:30357 (P;US)
Fabrication
Permanent magnet multipole with adjustable strength, 11:30357 (P;US)
Magnetic Fields
Permanent magnet multipole with adjustable strength, 11:30357 (P;US)
Positioning
Permanent magnet multipole with adjustable strength, 11:30357 (P;US)

PERMUTIT (ORGANIC)
See ORGANIC ION EXCHANGERS

PEROXIDES
See also HYDROGEN PEROXIDE
Reduction
Kinetics and mechanism of the alkylnickel formation in one-electron reductions of alkyl halides and hydroperoxides by a macrocyclic nickel(I) complex, 11:30246 (J;US)

PEROXY RADICALS
Dipole Moments
Measurement of the dipole moment of a peroxyl radical by microwave dielectric absorption, 11:30274 (J;US)

PERSONNEL
Studies of groups of persons employed in a particular field of endeavor. For studies on individuals in a group see also MAN.
Contamination
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)
Radiation Doses
Radiological analysis for dry cask storage of spent fuels, 11:29443 (RA;US)
Recent experiences with cement solidification systems, 11:29378 (RA;US)
Revised worker exposure estimates for TMI-2 radioactive waste processing and decontamination, 11:29442 (RA;US)
Training
Tritium Systems Test Assembly operator training program, 11:31202 (J;US)
TSORT - an automated tool for allocating tasks to training strategies, 11:29791 (R;US)

PERSONNEL DOSIMETRY
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)
PERSONNEL FILM DOSIMETRY
See PERSONNEL DOSIMETRY
PESTICIDES
See also INSECTICIDES
Gas Chromatography
Parallel capillary column gas chromatography in the determination of chlorinated pesticides and PCBs, 11:30186 (J;US)
Quantitative Chemical Analysis
Parallel capillary column gas chromatography in the determination of chlorinated pesticides and PCBs, 11:30186 (J;US)
PETN
Detonations
Radial buildup to detonation in pentaerythritol tetranitrate (PETN), 11:30514 (R;US)
PETROLEUM
Limited to crude oil; see also COAL LIQUIDS, SHALE OIL, etc.
Chemical Composition
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Economic Policy
Development potential and policies in the South Arabian countries Yemen Arab Republic, People's Democratic Republic of Yemen, Sultanate of Oman, 11:29938 (R;DE)
Energy Policy
Kuwait - energy situation 1984, 11:29929 (R;DE;In German)
Market
Petroleum marketing monthly, February 1986, 11:29246 (R;US)
Metabolism
Microbial biosurfactant - physiology, biochemistry, and applications, 11:29247 (J;US)
Phase Diagrams
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Phase Studies
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
Pour Point
Experience in switching to heavier fuel oils, 11:29240 (RA;US)
Production
Kuwait - energy situation 1984, 11:29929 (R;DE;In German)
Viscosity
Experience in switching to heavier fuel oils, 11:29240 (RA;US)
PETROLEUM COKE
See COKE
PETROLEUM PRODUCTS
PETROLEUM DEPOSITS
Exploration
Organic geochemistry of continental margin and deep ocean sediments. Final report, 11:29231 (R;US)
Seismic Surveys
Acoustic velocity measurements in materials using a regenerative method, 11:29232 (P;US)
PETROLEUM INDUSTRY
Energy Consumption
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume IA. Appendices with 1975 data. Final report, 11:29946 (R;US)
Industrial sector end use. Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume I. Summary of 1976 results. Final report, 11:29947 (R;US)
Industrial Sector Energy Consumption Data Base (ECDB) for 1975 and 1976. Volume II. Part 2. Documentation of results. Final report, 11:29980 (R;US)
Field Production Equipment
Costs and indices for domestic oil and gas field equipment and production operations, 1985, 11:29245 (R;US)
Financial Data
Development of financial statements for the domestic petroleum industry, 1977, 11:29244 (R;US)
Offshore Operations
Offshore oil and gas. A bibliography, 11:29230 (R;GB)
PETROLEUM PRODUCTS
See also DIESEL FUELS
FUEL OILS
LIQUEFIED PETROLEUM GASES
Gasification
Synthetic fuel gas from petroleum coke-performance in an industrial gasifier, 11:29238 (BA;US)
PETROLEUM RESIDUES
B.P. over 1100°F, 593°C; includes oil residues, residua.
Combustion Properties
Residual fuel oil markets: the source of changes in resid quality, 11:29237 (RA;US)
Refining
Residual fuel oil markets: the source of changes in resid quality, 11:29237 (RA;US)
Uses
Residual fuel oil markets: the source of changes in resid quality, 11:29237 (RA;US)
PETROLEUM STOCKS
See INVENTORIES
PETROSIX PROCESS
Update on the American Syn-Crude/Indiana Shale Oil Project, 11:29272 (BA;US)
PETT
See POSITRON COMPUTED TOMOGRAPHY
PETTEN HIGH FLUX REACTOR
See HFR REACTOR
PHASE CHANGE MATERIALS
Use with the specific phase change material (e.g. calcium chloride) when known.
Research Programs
Inorganic compounds for passive solar energy storage. Solid-state dehydration materials and high specific heat materials. Progress report, 11:29612 (R;US)
PHASE TRANSFORMATIONS
Phi4-Field Theory
About the obtention of static critical behaviours from the renormalization group techniques of field theory, 11:30879 (R;FR;In French)
PHENANTHROLINES
Chemical Reaction Kinetics
Kinetics and mechanisms of electron transfer between blue copper proteins and electronically excited chromium and ruthenium polypyridine complexes, 11:30292 (J;US)
PHENOL
Inventories
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Production
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Synthesis
Synthesis of oxygen-18 enriched phenol and naphthol from $^{18}O_2$, 11:30278 (J;GB)
PHENOLS
See also CRESOLS
NAPHTHOLS
PHENOL
Chemical Preparation
In situ study of the hydrogenation of diphenyl ether in the presence of pyrrhotite and H_2S, 11:30257 (J;US)
PHENYLAMINE
See ANILINE
PHOSPHATE ROCKS
Chemical Analysis
Use of arsenazo-III for the determination of uranium in phosphate materials. Study of interfering elements, 11:30180 (RA;BR;In Portuguese)
Materials Handling
Air pollution control: maintenance cost savings from the washing, patching and reuse of bags used in fabric filters, 11:30406 (RA;US)

PHOSPHINES
Chemical Preparation
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-$Cl)Mo(CO)(PF_2NHCH_3)$, 11:30231 (J;US)
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Crystal Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-$Cl)Mo(CO)(PF_2NHCH_3)$, 11:30231 (J;US)
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Molecular Structure
Metal complexes of fluorophosphines. 13. Reaction of fac-$(CH_3CN)_3Mo(CO)_3$ with (methylamino)bis(difluorophosphine). X-ray crystal structure analysis of a novel binuclear molybdenum fluorophosphine carbonyl complex with a bridging chlorine atom: $(CO)_2Mo[^+$-$CH_3N(PF_2)_2]_2(\mu$-$PF_2)(\mu$-$Cl)Mo(CO)(PF_2NHCH_3)$, 11:30231 (J;US)
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
PHOSPHODIESTERASES
Code number 3.1.4.
Enzyme Activity
Enzymatic assay for calmodulins based on plant NAD kinase activity, 11:30640 (J;US)
PHOSPHORESCENCE
Pressure Dependence
Effect of high pressure on critical concentration energy transport in isotopically mixed naphthalene crystals, 11:30255 (J;US)
PHOSPHORIC ACID
Ion Exchange
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
Solvent Properties
Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid, 11:29424 (J;NL)
PHOSPHORUS 32
Tracer Techniques
Periphyton production and grazing rates in a stream measured with a ^{32}P material balance method, 11:30606 (J;DK)
PHOSPHORUS COMPLEXES
Chemical Preparation
Synthesis and X-ray structure of $(C_5Me_5)_2Th(\mu$-$PPh_2)_2Pt(PMe_3)$: a complex with a thorium-platinum bond, 11:30316 (J;US)
Crystal Structure
Synthesis and X-ray structure of $(C_5Me_5)_2Th(\mu$-$PPh_2)_2Pt(PMe_3)$: a complex with a thorium-platinum bond, 11:30316 (J;US)
PHOSPHORUS OXIDES
Adsorption
Ion-exchange properties of activated carbon filled with hydrous Zr(IV) and Zr(IV)-P(V) oxides, 11:30174 (J;NL)
PHOSPHORYLASES
See PHOSPHOTRANSFERASES
PHOSPHOTRANSFERASES
(Code numbers 2.7.1 to 2.7.6 and 2.7.8 to 2.7.9)
Biosynthesis
Synthesis and uptake of cytoplasmically synthesized pyruvate, Pi dikinase polypeptide by chloroplasts, 11:30629 (J;US)
Enzyme Activity
Enzymatic assay for calmodulins based on plant NAD kinase activity, 11:30640 (J;US)
Histochemical technique: a general method for quantitative enzyme assays of single cell extracts with a time resolution of seconds and a reading precision of femtomoles, 11:30634 (J;US)
Purification
Enzymatic assay for calmodulins based on plant NAD kinase activity, 11:30640 (J;US)
Radioimmunoassay
Pyruvate, Pi dikinase in bundle sheath strands as well as in mesophyll cells in maize leaves, 11:30669 (J;US)
Uptake
Synthesis and uptake of cytoplasmically synthesized pyruvate, Pi dikinase polypeptide by chloroplasts, 11:30629 (J;US)
PHOTOCHROMIC MATERIALS
Chemical Preparation
Method for the preparation of photochromic insulating crystals, 11:30171 (P;US)
Fabrication
Method for the preparation of photochromic insulating crystals, 11:30171 (P;US)
PHOTOMAGNETIC EFFECT
See VISIBLE RADIATION
PHOTOMAGNETOELECTRIC EFFECT
See MAGNETIC FIELDS
PHOTOMULTIPLIERS
Design
Tetrode photomultiplier base for high magnetic field environments, 11:30458 (J;US)
PHOTON ACTIVATION ANALYSIS
See PHOTONS
PHOTON DETECTION (GAMMA)
See GAMMA DETECTION
PHOTON DETECTION (X-RAY)
See X-RAY DETECTION
PHOTON TRANSPORT
Computer Codes
Diffusion approximation for modeling of 3-D radiation distributions, 11:30948 (R;US)
PHOTONS
Detection
ASP: a search for single photon events at PEP, 11:30846 (R;US)
Structure Functions
Measurement of the $F_2sup(\gamma)$ photon structure function at LEP, 11:30874 (R;FR)
PHOTOPRODUCTION
Prompt Electrons
Search of prompt electrons in the NA14 photoproduction experiment at the CERN, 11:30836 (R;FR;In French)
PHOTOSYNTHESIS
Biological Pathways
Reduced apparent photorespiration by the C_3-C_4 intermediate species, Moricandia arvensis and Panicum milioides, 11:30633 (J;US)
Potentiometry
Potentiometric titration of Photosystem II fluorescence decay kinetics in spinach chloroplasts, 11:30642 (J;NL)
Thermodynamics
Photosynthetic water splitting. Annual report, March 1, 1985-February 28, 1986, 11:29546 (R;US)
PHOTOSYNTHETIC MEMBRANES
Chemical Properties
[Mesityl]bacteriorhodopsin. The properties of an analogue of the purple membrane containing [mesityl]retinal as the chromophore, 11:30637 (J;GB)
Emission Spectra
Membrane development in the cyanobacterium, Anacystis nidulans, during recovery from iron starvation, 11:30671 (J;US)

Mass Spectroscopy
Depletion of photosystem 2 extrinsic proteins. I. Effects of O_2 and N_2 flash yields and steady state O_2 evolution, 11:29502 (R;US)

PHOTOSYNTHETIC REACTION CENTERS
Biochemical Reaction Kinetics
Depletion of photosystem 2 extrinsic proteins. I. Effects of O_2 and N_2 flash yields and steady state O_2 evolution, 11:29502 (R;US)

PHOTOVOLTAIC POWER PLANTS
Economic Analysis
Cell efficiency and module cost goals to achieve economic photovoltaic central power systems in the United States, 11:29563 (BA;US)
Meetings
Space photovoltaic research and technology 1985: high efficiency, space environment, and array technology, 11:29516 (R;US)
Sensitivity Analysis
Sensitivity analysis of central station flat-plate photovolaic systems and implications for National Photovoltaics Program planning, 11:29559 (R;US)

PHOTOVOLTAIC POWER SUPPLIES
Design
Block V module development and test results, 11:29554 (BA;US)
Field Tests
Photovoltaic array thermal behavior, 11:29562 (BA;US)
Performance Testing
Block V module development and test results, 11:29554 (BA;US)
Power Demand
Power requirements for commercial communications spacecraft, 11:29561 (RA;US)
Temperature Measurement
Photovoltaic array thermal behavior, 11:29562 (BA;US)

PHYSICAL METALLURGY
Research Programs
Chemistry research resource. Progress report, March 1986, 11:30175 (R;US)

PHYSICAL RADIATION EFFECTS
Simulation
Effect of helium on the tensile properties of several vanadium alloys, 11:31058 (RA;US)

PHYTOCHROMES
See also CHLOROPHYLL
Conformational Changes
ESR and ENDOR of bacteriopheophytin a radicals. Implications for bacteriochlorophylls in vivo, 11:30625 (J;US)
Electronic Structure
ESR and ENDOR of bacteriopheophytin a radicals. Implications for bacteriochlorophylls in vivo, 11:30625 (J;US)

PICEANCE CREEK BASIN
Geochemical Surveys
Fluorine in Colorado oil shale, 11:29276 (BA;US)
Geologic Surveys
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
Hydrology
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
Lithology
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Oil Shale Deposits
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Dust and preasure generated during commercial oil shale mine blasting, 11:29260 (BA;US)
Fluorine in Colorado oil shale, 11:29276 (BA;US)
Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Sedimentary Rocks
Elastic and viscoelastic model of the stress history of sedimentary rocks, 11:30754 (R;US)

PICOLINIC ACID
Leaching
Release of organic reagents from solidified decontamination wastes, 11:29433 (RA;US)

PIGE ANALYSIS
See PROTON REACTIONS

PIGMENT CELLS
See ANIMAL CELLS

PINACOL
Energy Transfer
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Isomerization
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Oxidation
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)
Photolysis
Photoinduced electron transfer C-C bond cleavage reactions; oxidations and isomerizations, 11:30298 (J;CA)

PINS (FUEL)
See FUEL PINS

PION MINUS-PROTON INTERACTIONS
Pion electroproduction at threshold in the inverse channel: $\pi p \rightarrow ne^+e$. Determination method of the longitudinal multipole Lsub(0+)sup(π) at small transfer. Preparation of the experiment, 11:30842 (R;FR;In French)

PION PLUS REACTIONS
Scattering Amplitudes
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)
Total Cross Sections
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)

PION PLUS-PROTON INTERACTIONS
Baryonium
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)
Scattering Amplitudes
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)
Total Cross Sections
High accuracy measurement of the total cross section and of the real part of the scattering amplitude $\pi^+ p$ from 2 to 14 GeV/c, 11:30841 (R;FR;In French)

PION REACTIONS
See also PION PLUS REACTIONS
Giant Resonance
Can we learn about the spin flip giant dipole resonances with pions?, 11:30940 (BA;US)
Inelastic Scattering
Spin excitations in pion inelastic scattering, 11:30939 (BA;US)
N*Resonances
Evidence for Δ-h components from pion reactions, 11:30938 (BA;US)
Spin Flip
Can we learn about the spin flip giant dipole resonances with pions?, 11:30940 (BA;US)

PION-NUCLEON INTERACTIONS
Partial Waves
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1983-April 30, 1984, 11:30854 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1982-April 30, 1983, 11:30853 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1980-April 30, 1981, 11:30852 (R;US)
Partial wave analysis of π-N, NN, and KN scattering below 2 GeV. Progress report, June 1, 1979-May 31, 1980, 11:30851 (R;US)
Partial wave analyses of scattering below 2 GeV. Progress report, May 1, 1984-April 30, 1985, 11:30855 (R;US)
Partial wave analyses of hadron scattering below 2 GeV. Progress report, May 1, 1985-April 30, 1986, 11:30856 (R;US)

PIONS
See also PIONS MINUS
Photoproduction
Pion photoproduction in nuclei, 11:30892 (R;FR)
Spin
Spin excitations in pion inelastic scattering, 11:30939 (BA;US)

PIONS MINUS
Electroproduction
Pion electroproduction at threshold in the inverse channel: $\pi p \rightarrow ne^+e$. Determination method of the longitudinal multipole Lsub(0+)sup(π) at small transfer. Preparation of the experiment, 11:30842 (R;FR;In French)

PIPELINE QUALITY GAS
See HIGH BTU GAS

PIPELINES
Environmental Impacts
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

PIPES
Crack Propagation
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)

PLANT CELLS
Biological Adaptation
Abscisic acid accelerates adaptation of cultured tobacco cells to salt, 11:30645 (J;US)
Proteins associated with adaptation of cultured tobacco cells to NaCl, 11:30644 (J;US)
Cytochemistry
Histochemical technique: a general method for quantitative enzyme assays of single cell extracts with a time resolution of seconds and a reading precision of femtomoles, 11:30634 (J;US)

PLANTS
See also ARABIDOPSIS
CAPSICUM
GRASS
MOSSES
TREES
Ecology
Division of Stress and Wildlife Ecology FY-1985 highlights, 11:30570 (RA;US)
Radionuclide Kinetics
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)

PLANTS (INDUSTRIAL)
See INDUSTRIAL PLANTS

PLANTS (POWER)
See POWER PLANTS

PLASMA
See also COLD PLASMA
COLLISIONAL PLASMA
COLLISIONLESS PLASMA
HOT PLASMA
INHOMOGENEOUS PLASMA
LASER-PRODUCED PLASMA
SOLID-STATE PLASMA
Boltzmann-Vlasov Equation
Theory of the plasma edge: recycling sheaths, 11:31010 (BA;US)
Boundary Conditions
Theory of the plasma edge: recycling sheaths, 11:31010 (BA;US)
Boundary Layers
A new concept for pumping the edge plasma, 11:31237 (J;US)
Distribution Functions
Electron energy distributions and excitation rates in high-frequency argon discharges, 11:30977 (R;FR)
Modifications
Modification of a commercially available ICP for application to radioactive analyses, 11:30506 (J;US)
Proton Beams
Automatic measurement of characteristic quantities of nuclear plasma, 11:30968 (R;FR;In French)
Pumping
A new concept for pumping the edge plasma, 11:31237 (J;US)
Radiations
Model for electron cooling by radiation losses in plasmas: application to soft x-ray laser development, 11:31078 (R;US)

PLASMA CONFINEMENT
See also INERTIAL CONFINEMENT
Magnetic Surfaces
Numerical determination of the magnetic field line Hamiltonian, 11:31079 (R;US)
Research Programs
Strategic framework for the magnetic fusion energy program, 11:31009 (J;US)

PLASMA DIAGNOSTICS
Calorimeters
Characterization of the TFTR plasma edge by Langmuir-calorimeter probes, 11:30980 (R;US)
Carbon Dioxide Lasers
Effects of alpha particles on the scattering function in CO_2 laser scattering, 11:30991 (J;AT)
Design
Low activation diagnostic equipment design studies, 11:31002 (J;US)
Feedback
TFTR plasma feedback systems, 11:31004 (J;US)
HgI2 Semiconductor Detectors
X-ray spectra for 10 keV less than h v less than 100 keV from the Alcator C tokamak, 11:31017 (BA;US)
Holography
S3T working group. Report 1: group aims (Time-space spectral signature), 11:30976 (R;FR;In French)
Ion Beams
Cw dye laser system for Li beam spectroscopy in a tokamak, 11:30972 (R;US)
Plasma density and poloidal field measurements on text using an injected lithium beam, 11:30971 (R;US)
Langmuir Probe
Characterization of the TFTR plasma edge by Langmuir-calorimeter probes, 11:30980 (R;US)
Magnet Coils
Note on the Mirnov signal analysis in tokamaks, 11:30992 (J;AT)
Parallel Processing
Two parallel formulations of particle-in-cell models, 11:31291 (BA;US)
Performance
Tokamak plasma density fluctuation studies using a multichannel scattering apparatus, 11:31015 (BA;US)
Physical Radiation Effects
Bremsstrahlung shielding analysis of the particle beam fusion accelerator PBFA II, 11:31220 (J;US)
Low activation diagnostic equipment design studies, 11:31002 (J;US)
Shielding analysis for the horizontal x-ray imaging system on the TFTR, 11:31001 (J;US)
Radiation Protection
Bremsstrahlung shielding analysis of the particle beam fusion accelerator PBFA II, 11:31220 (J;US)

Radioactivation
Low activation diagnostic equipment design studies, 11:31002 (J;US)
Shielding
Low activation diagnostic equipment design studies, 11:31002 (J;US)
Shielding analysis for the horizontal x-ray imaging system on the TFTR, 11:31001 (J;US)
X-Ray Spectrometers
X-ray spectra for 10 keV less than h v less than 100 keV from the Alcator C tokamak, 11:31017 (BA;US)
Zeeman Effect
Current profile diagnostic development on text using the Zeeman effect, 11:31014 (BA;US)

PLASMA DIODES
See THERMIONIC DIODES

PLASMA DISRUPTION
Plasma Simulation
Simulating the effects of plasma disruption with A 1 MA current pulse in a coaxial test fixture, 11:31006 (J;US)

PLASMA HEATING
See also HIGH-FREQUENCY HEATING
Research Programs
Strategic framework for the magnetic fusion energy program, 11:31009 (J;US)

PLASMA MACROINSTABILITIES
Computer Calculations
Finite-beta global MHD stabilities for circular and highly-elongated tokamaks with and without poloidal divertors, 11:30970 (R;US)

PLASMA OSCILLATIONS
See PLASMA WAVES

PLASMA SIMULATION
Boundary Conditions
Question of consistent boundary conditions when simulating reversed field pinch dynamics. Revision 1, 11:30986 (R;US)
Multi-Parameter Analysis
Real-time evaluation of electron and current density profile parameters on TEXTOR, 11:30973 (R;DE)

PLASMA SWITCHES
Feasibility Studies
Theoretical modeling of the plasma opening switch, 11:31020 (BA;US)
Mathematical Models
Theoretical modeling of the plasma opening switch, 11:31020 (BA;US)
Performance
Scaling experiments on plasma opening switches for inductive energy storage applications, 11:31265 (BA;US)
Scaling Laws
Scaling experiments on plasma opening switches for inductive energy storage applications, 11:31265 (BA;US)

PLASMA WAVES
Excitation
Electric and magnetic excitation of ICRF waves: eigenmodes and wave packets, 11:31023 (BA;US)

PLASMONS
Radiative Decay
Radiative decay of surface plasmons on nonspherical silver particles, 11:30115 (BA;US)

PLASTIC PROPERTIES
See PLASTICITY

PLASTIC SCINTILLATION COUNTERS
See PLASTIC SCINTILLATION DETECTORS

PLASTIC SCINTILLATION DETECTORS
Performance
Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
Response Functions
Plastic scintillator response to relativistic nuclei, Z<=28, 11:30484 (J;NL)
Time-of-Flight Method
Neutron polarimeter for (p, n) measurements at intermediate energies, 11:30487 (J;NL)

PLASTICITY
Computerized Simulation
Elasto-plastic benchmark calculations. Step 1: verification of the numerical accuracy of the computer programs (LMFBR components), 11:31278 (R;FR)

PLASTICIZERS
Mineralogy
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)

PLASTICS
See also POLYSTYRENE
Sealing Materials
Sealing biogas plants with flexible plastic covers. Experiences gained with a German digester, 11:29478 (RA;DE)

PLASTOQUINONE
Biochemistry
Fermentative metabolism of Chlamydomonas reinhardtii. II. Role of plastoquinone, 11:30653 (J;US)

PLATING SOLUTIONS
See PROCESS SOLUTIONS

PLATINUM 196
Nuclear Electric Moments
Quadrupole moment of ^{196}Pt - a crucial test of nuclear models, 11:30919 (R;AU)
Quadrupole Moments
Quadrupole moment of ^{196}Pt - a crucial test of nuclear models, 11:30919 (R;AU)

PLATINUM COMPLEXES
Chemical Preparation
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)
Chemical Reactions
Formation and reactivity of metal-ligand bonds: platinum(I) dimers and cobalt and chromium alkyls, 11:30222 (D;US)

PLESIOTHERAPY
See RADIOTHERAPY

PLT DEVICES
Current-Drive Heating
Top-versus-side launch of lower hybrid waves in PLT, 11:30990 (J;AT)
Lower Hybrid Heating
Top-versus-side launch of lower hybrid waves in PLT, 11:30990 (J;AT)

PLUMES
Diffusion
Contribution to the study of radioactive and heavy jets discharged in the presence of a cross-stream, 11:30560 (R;FR;In French)
Opacity
Microcomputer programs for precipitator performance estimates, 11:29696 (RA;US)
Power plant plume opacity control, 11:29704 (RA;US)
Prediction of plume opacity from stationary sources, 11:30528 (RA;US)

PLUTONIUM
Adsorption
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Isotope Ratio
Removal of isobaric interferences by resonance ionization mass spectrometry, 11:30188 (J;US)
Particle Resuspension
Remedial waste management practices resulting in the decline of airborne plutonium adjacent to a liquid waste disposal ditch at the Hanford site, 11:29435 (RA;US)
Partition
Acid-split flowsheets for uranium-plutonium partitioning without a reductant, 11:29293 (R;US)
Personnel Monitoring
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)

Radiochemistry
Radiochemistry of uranium, neptunium and plutonium: an updating, 11:30311 (R;US)
Radioecological Concentration
Distribution of plutonium and americium beneath a 33-year-old liquid waste disposal site, 11:30618 (J;US)
Recovery
Waste Systems progress report, March 1984-February 1985, 11:29413 (R;US)
Reduction
Reduction of plutonium(IV) using photochemically generated uranium(IV), 11:30313 (R;US)
Work Functions
Mound activities in chemical and physical research: July-December 1985, 11:30196 (R;US)

PLUTONIUM 238
Leaching
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)

PLUTONIUM 239
Ecological Concentration
Plutonium and radiocesium in the water column of the Hudson River Estuary, 11:30619 (J;US)
Environmental Transport
Plutonium and radiocesium in the water column of the Hudson River Estuary, 11:30619 (J;US)
Leaching
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)

PLUTONIUM 240
Ecological Concentration
Plutonium and radiocesium in the water column of the Hudson River Estuary, 11:30619 (J;US)
Environmental Transport
Plutonium and radiocesium in the water column of the Hudson River Estuary, 11:30619 (J;US)
Half-Life
Excitation function and half-life for the fission isomer sup(240m) Pu from the ^{238}U(α, 2n) sup(240m) Pu reaction, 11:30928 (R;BR)
Leaching
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)

PLUTONIUM NITRATES
Biological Effects
Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences, 11:30696 (R;US)

PLUTONIUM OXIDES
Biological Effects
Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences, 11:30696 (R;US)

PNA
See POLYCYCLIC AROMATIC HYDROCARBONS

PNL
See BATTELLE PACIFIC NORTHWEST LABORATORIES

POINT CONTACTS
See ELECTRIC CONTACTS

POISONS (CHEMICAL)
See HAZARDOUS MATERIALS

POLAND
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Seasonal Thermal Energy Storage
STES newsletter: a quarterly review of seasonal thermal energy storage, 11:29988 (J;US)

POLARIMETERS
Time-of-Flight Method
Neutron polarimeter for (p, n) measurements at intermediate energies, 11:30487 (J;NL)

POLARIZED BEAMS
Beam Production
Collisonal pumping for the production of intense spin-polarized neutral BEAMS: target considerations, 11:31219 (J;US)

POLARIZED TARGETS
Nuclear Magnetic Resonance
TRIUMF polarized deuteron target NMR system, 11:30417 (R;CA)

POLLUTION ABATEMENT
Use this term for itmes that involve the prevention of pollutants at the source.
Research Programs
Federal Environmental Office annual report 1984, 11:29906 (R;DE;In German)

POLLUTION CONTROL EQUIPMENT
See also BAGHOUSES
ELECTROSTATIC PRECIPITATORS
SCRUBBERS
Design
Technical manual on hood capture systems to control process fugitive particulate emissions, 11:29728 (RA;US)
Evaluation
Evaluation of chemical stabilizers and windscreens for wind erosion control of uranium mill tailings, 11:30557 (RA;US)
Feasibility Studies
Feasibility of using parameter monitoring as an aid in determining continuing compliance of particulate control devices, 11:29741 (RA;US)
Manuals
Technical manual on hood capture systems to control process fugitive particulate emissions, 11:29728 (RA;US)
Performance
Impact of proposed acid rain legislation on power plant particulate control equipment, 11:29692 (RA;US)
Performance Testing
Evaluation of an air curtain secondary hooding system, 11:30531 (RA;US)
Evaluation of street sweeping as a means of controlling urban particulate, 11:30534 (RA;US)
Pilot demonstration of air curtain control of buoyant fugitive emissions, 11:30529 (RA;US)

POLLUTION LAWS
Cost
Framework for resolving hazardous waste cleanup liability, 11:30593 (RA;US)

POLLUTION REGULATIONS
Regulations for nonradioactive pollution only; see also CONTAMINATION REGULATIONS.
An overview of international NO/sub x/ control regulations, 11:29229 (R;GB)
Compliance
Management of active and abandoned hazardous sites under federal statutes, 11:29331 (RA;US)

POLLUTION (THERMAL)
See THERMAL POLLUTION

POLOIDAL DIVERTORS
See POLOIDAL FIELD DIVERTORS

POLOIDAL FIELD DIVERTORS
Comparative Evaluations
A comparison study of toroidal-field divertors for a Compact Reversed-Field Pinch Reactor, 11:31176 (J;US)
Impact of a poloidal divertor in ignition tokamak design, 11:31186 (J;US)
Design
Impact of a poloidal divertor in ignition tokamak design, 11:31186 (J;US)
Feasibility Studies
Impact of a poloidal divertor in ignition tokamak design, 11:31186 (J;US)

POLONIUM
Activity Levels
Polonium aspects associated with the use of lead-lithium blankets in fusion applications, 11:31221 (J;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)

POLYACRYLONITRILE
See ORGANIC POLYMERS

POLYATOMIC MOLECULES
Eigenstates
Exact eigenfunctions and eigenvalues of a two-dimensional rigid rotor obtained using Gaussian wave packet dynamics, 11:30816 (J;US)
POLYCARBONATES
Absorption Spectroscopy
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
Isomers
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
POLYCRYSTALS
Nuclear Magnetic Resonance
Proton and deuterium NMR experiments in zero field, 11:30814 (R;US)
Oxidation
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
Photochemistry
Diffusion controlled and transient photocurrents of photo-oxidation reactions at polycrystalline α-Fe_2O_3, 11:30295 (J;US)
POLYCYCLIC AROMATIC AMINES
DNA Adducts
Environmental carcinogens in human target tissues in culture. Progress report, 11:30715 (R;US)
Metabolic Activation
Environmental carcinogens in human target tissues in culture. Progress report, 11:30715 (R;US)
Mutagenesis
Pacific Northwest Laboratory annual report for 1985 to the DOE Office of Energy Research. Part 1. Biomedical sciences, 11:30696 (R;US)
POLYCYCLIC AROMATIC HYDROCARBONS
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
POLYENES
See also DIENES
Radiolysis
Transient phenomena in the pulse radiolysis of retinyl polyenes. 4. Environmental effects on absorption maximum of retinal radical anion, 11:30302 (J;US)
POLYETHERS
See POLYETHYLENE GLYCOLS
POLYETHYLENE GLYCOLS
Chemical Preparation
Synthesis, rapid resolution, and determination of absolute configuration of racemic 2,2′-binaphthyldiyl crown ethers and analogues via β-cyclodextrin complexation, 11:30260 (J;US)
Chemical Reactions
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986, 11:29182 (R;US)
Configuration
Synthesis, rapid resolution, and determination of absolute configuration of racemic 2,2′-binaphthyldiyl crown ethers and analogues via β-cyclodextrin complexation, 11:30260 (J;US)
POLYETHYLENE OXIDES
See POLYETHYLENE GLYCOLS
POLYETHYLENES
Phase Transformations
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
Polymerization
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
Structural Chemical Analysis
Small-angle neutron-scattering study of alkyl polyoxyethylene sulfate micelles. Effect of the number of polyoxyethylene groups on n-dodecyl polyoxyethylene sulfate in D_2O/H_2O mixtures at 25°C, 11:30263 (J;US)
POLY(ISOBUTYLENE OXIDE)
See EPOXIDES
ORGANIC POLYMERS
POLYMER FLOODING
See WATERFLOODING
POLYMERS
See also ORGANIC POLYMERS
Absorption Spectroscopy
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
Chemical Preparation
Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)
Isomers
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
Mechanical Properties
Chemistry research resource. Progress report, March 1986, 11:30175 (R;US)
Radiolysis
Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)
POLYNUCLEAR AROMATIC HYDROCARBONS
See POLYCYCLIC AROMATIC HYDROCARBONS
POLYPHENYLS
See also TERPHENYLS
Acoustic ESR
Electron spin echo studies of donor-doped poly(p-phenylene) and its oligomers, 11:30272 (J;GB)
POLYSTYRENE
Polymerization
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
Sorptive Properties
Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985, 11:30237 (R;US)
Vulcanization
Correlation networks in polymeric materials determined by small-angle neutron scattering, 11:30146 (J;US)
POLYSULFIDES
See SULFIDES
POLYTETRAOXANE
See ORGANIC POLYMERS
POLYTHENE
See POLYETHYLENES
POLYTHIONATES
See OXYGEN COMPOUNDS
POLYTHIONIC ACIDS
See OXYGEN COMPOUNDS
POPULATION DYNAMICS
Mathematical Models
Need to test assumptions of models: the population biology of sessile invertebrates on coral reefs, 11:30602 (RA;US)
Use of a population model for estimating hazards: interpretation of low pH bioassay results with respect to Norwegian trout populations, 11:30598 (RA;US)
Use of time series methods for estimating hazard, 11:30599 (RA;US)
Statistical Models
Statistical approaches for quantitatively assessing ecological impacts and risks, 11:30600 (RA;US)
PORPHYRINS
See also CHLOROPHYLL
HEMOGLOBIN
Electron Transfer
Mutual orientation effects on electron transfer between porphyrins, 11:30240 (J;US)
Polymerization
Raman spectroscopy of polymers of metal protoporphyrin free acids on metal electrodes, 11:30283 (J;US)
Raman Effect
Surface Raman scattering and electrochemistry of iron protoporphyrin IX at a polycrystalline silver electrode, 11:30282 (J;US)

Voltametry
Surface Raman scattering and electrochemistry of iron protoporphyrin IX at a polycrystalline silver electrode, 11:30282 (J;US)
PORTABLE EQUIPMENT
To be used only if portability is unusual or is the significant aspect of the equipment.
Operation
Testing and operation of a transportable volume reduction unit, 11:29363 (RA;US)
Performance Testing
Testing and operation of a transportable volume reduction unit, 11:29363 (RA;US)
PORTLAND CEMENT
Radionuclide Migration
Leach resistance of iodine compounds in Portland cement, 11:29425 (J;US)
POSITION SENSITIVE DETECTORS
Construction
A silicon vertex detector for CDF, 11:30446 (J;US)
Design
A silicon vertex detector for CDF, 11:30446 (J;US)
Feasibility tests of a high resolution sampling radial drift chamber, 11:30488 (J;NL)
Fabrication
300-element silicon-lithium position-sensitive imaging detector for angiography, 11:30430 (J;US)
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
Feasibility Studies
Feasibility tests of a high resolution sampling radial drift chamber, 11:30488 (J;NL)
Performance
300-element silicon-lithium position-sensitive imaging detector for angiography, 11:30430 (J;US)
Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
Performance Testing
Detection of charged particles in amorphous silicon layers, 11:30428 (J;US)
Testing
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
POSITIVE IONS
See CATIONS
POSITRON COMPUTED TOMOGRAPHY
BGO Detectors
Examination of the role of detection systems in quantitation and image quality in PET, 11:30439 (J;US)
Multiwire Proportional Chambers
Mesh chambers for positron emission tomography, 11:30666 (J;US)
NaI Detectors
Examination of the role of detection systems in quantitation and image quality in PET, 11:30439 (J;US)
Time-of-Flight Method
System architecture for high speed reconstruction in Time-Of-Flight positron tomography, 11:30659 (R;FR)
POSTULATED PARTICLES
See also HEAVY LEPTONS
HIGGS BOSONS
MAGNETIC MONOPOLES
QUARKS
Supersymmetry
Composite quasi Nambu-Goldstone fermions, 11:30869 (RA;JP)
POTABLE WATER
See DRINKING WATER
POTASSIUM
Crystal Doping
Electron spin echo studies of donor-doped poly(p-phenylene) and its oligomers, 11:30272 (J;GB)
POTASSIUM CARBONATES
Corrosive Effects
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
POTASSIUM COMPOUNDS
See also POTASSIUM CARBONATES
POTASSIUM SULFATES
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
POTASSIUM SULFATES
Corrosive Effects
Electrochemical corrosion of iron-magnesium-aluminum spinel in molten potassium salts and coal slag, 11:29983 (J;US)
Phase Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
POTENTIAL (ELECTRIC)
See ELECTRIC POTENTIAL
POWDER RIVER BASIN
Air Quality
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
Coal Mines
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
POWER DEMAND
Forecasting
Annual outlook for US electric power, 1986, 11:29945 (R;US)
Forecasting electricity use in the service sector, 11:29974 (RA;US)
POWER GENERATION
See also COGENERATION
Cost
Cool water Integrated Coal Gasification Combined Cycle project: status and results, 11:29680 (R;SE)
Forecasting
Annual outlook for US electric power, 1986, 11:29945 (R;US)
POWER LOSSES
Cost
Compensation of reactive power in buildings, 11:29998 (R;FI;In Finnish)
POWER PLANTS
See also GAS TURBINE POWER PLANTS
HYDROELECTRIC POWER PLANTS
THERMAL POWER PLANTS
THERMONUCLEAR POWER PLANTS
WIND POWER PLANTS
Cooling Systems
Fouling control in cooling systems using brackish water, 11:29681 (R;FI;In Finnish)
Corrosion
Fouling control in cooling systems using brackish water, 11:29681 (R;FI;In Finnish)
Efficiency
Accumulators for the system of power plants delivering heat and electricity, 11:29877 (R;SE;In Swedish)
POWER REACTORS
See also ARDENNES B-1 REACTOR
ARKANSAS-1 REACTOR
BEAVER VALLEY-2 REACTOR
BROWNS FERRY-1 REACTOR
CALVERT CLIFFS-1 REACTOR
DAVIS BESSE-1 REACTOR
OCONEE-1 REACTOR
PALO VERDE-2 REACTOR
SOUTH TEXAS PROJECT-1 REACTOR
SOUTH TEXAS PROJECT-2 REACTOR
SPACE POWER REACTORS
THREE MILE ISLAND-2 REACTOR
Power Generation
Licensed operating reactors. Status summary report, data as of February 28, 1986. Volume 10, No. 3, 11:29789 (R;US)
Pressure Vessels
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Reactor Materials
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Reactor Operation
Licensed operating reactors. Status summary report, data as of February 28, 1986. Volume 10, No. 3, 11:29789 (R;US)

POWER SUPPLIES
See also PHOTOVOLTAIC POWER SUPPLIES SPACECRAFT POWER SUPPLIES
Control Systems
Multivariable current control for electrically and magnetically coupled superconducting magnets, 11:31187 (J;US)
POWER SYSTEMS
Includes electric power networks with associated generating and transmission facilities.
Computerized Simulation
Spacecraft orbital power evaluation (SCOPE), 11:30396 (RA;FR)
Energy Balance
Spacecraft orbital power evaluation (SCOPE), 11:30396 (RA;FR)
PRASEODYMIUM OXIDES
Phase Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
PREAMPLIFIERS
Design
A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers, 11:30471 (J;US)
PREDICTION
See FORECASTING
PRENATAL IRRADIATION
Biological Radiation Effects
Axial skeleton malformations induced by 5 fluoro-2'-desoxycytidine (FCdR) and X-rays in mice of the breeding strains C57Bl/6JHanFfm, C57Bl/10JFfm, and in hamsters of the GHFfm breeding strain. A comparative evaluation considering gestation stages and dose-response-relationships, 11:30692 (R;DE;In German)
Teratogenesis
Axial skeleton malformations induced by 5 fluoro-2'-desoxycytidine (FCdR) and X-rays in mice of the breeding strains C57Bl/6JHanFfm, C57Bl/10JFfm, and in hamsters of the GHFfm breeding strain. A comparative evaluation considering gestation stages and dose-response-relationships, 11:30692 (R;DE;In German)
PRESSURE (VAPOR)
See VAPOR PRESSURE
PRESSURE VESSELS
Air
Simple blast model for structural design, 11:30513 (R;US)
Blast Effects
Simple blast model for structural design, 11:30513 (R;US)
Chromium-Molybdenum Steels
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Crack Propagation
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
Cracks
Pressurized-thermal-shock experiments with thick vessels, 11:29796 (R;US)
Design
Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research, 11:29859 (R;US)
Dosimetry
Light Water Reactor Pressure Vessel Surveillance Dosimetry Improvement Program. PSF Blind Test workshop minutes. Summary, 11:29750 (R;US)
Research Programs
Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research, 11:29859 (R;US)
Testing
Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research, 11:29859 (R;US)
PRESSURIZED WATER COOLED MODERATED REACTO
See PWR TYPE REACTORS
PRESSURIZED WATER REACTORS
See PWR TYPE REACTORS
PRESTRESSED CONCRETE
Explosive Fracturing
Study of explosive demolition techniques for heavy reinforced and prestressed concrete structures, 11:29835 (R;FR)
PRICE-ANDERSON ACT
Amendments
Price-Anderson Act Amendments Act of 1985. Hearing before the Subcommittee on Energy Research and Development of the Committee on Energy and Natural Resources, United States Senate, Ninety-Ninth Congress, First Session on S. 1225, June 25, 1985, 11:29874 (B;US)
PRIMARY COOLANT CIRCUITS
Heat Transfer
Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Hydraulics
Simulation of FIST tests using TRAC-BD1/MOD1, 11:29827 (R;US)
Incompressible Flow
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
PRIMARY COSMIC RADIATION
See also COSMIC GAMMA BURSTS
Energy Spectra
Observation of ultra high energy cosmic rays($>=10^{10}$GeV), 11:30781 (RA;JP)
Magnetic Monopoles
Monopole annihilations and the knee in cosmic ray data, 11:30829 (RA;JP)
Mass Spectra
Observation of ultra high energy cosmic rays($>=10^{10}$GeV), 11:30781 (RA;JP)
PRINCETON LARGE TORUS
See PLT DEVICES
PRINTED CIRCUITS
Surface Cleaning
Determination of Cr(III) in chromic acid. Comparison of spectrophotometric and ion chromatographic methods, 11:30176 (R;US)
PROCESS SOLUTIONS
Purification
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
Water Treatment
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
PRODUCTION (HYDROGEN)
See HYDROGEN PRODUCTION
PRODUCTION REACTORS
For the production of fissile materials only; see also IRRADIATION REACTORS.
Fire Hazards
Literature review of fire modelling techniques and related subjects, 11:29865 (R;GB)
PROJECTION SPARK CHAMBERS
Construction
The recent operational performance of the CERN Omega Ring Imaging Cerenkov Detector, 11:30450 (J;US)
Design
The recent operational performance of the CERN Omega Ring Imaging Cerenkov Detector, 11:30450 (J;US)
Performance
Performance of the field-shaping strips in the TOPAZ-TPC sector, 11:30453 (J;US)
Performance Testing
The recent operational performance of the CERN Omega Ring Imaging Cerenkov Detector, 11:30450 (J;US)

PROLINE
Uptake
Relationship between stress-induced ABA and proline accumulations and ABA-induced proline accumulation in excised barley leaves, 11:30675 (J;US)
PROPAGATION (WAVE)
See WAVE PROPAGATION
PROPANE
Adsorption
Adsorption and desorption of hydrocarbons at low concentrations. Progress report, 1 December 1984-30 November 1985, 11:30237 (R;US)
Combustion
Experimental investigation of the acceleration of deflagration in wake flow, 11:30323 (R;FR)
Oxidation
Chemical kinetics of propane oxidation in gaseous detonations, 11:29488 (J;US)
PROPANONE
See ACETONE
PROPELLANTS
Comparative Evaluations
Effects of wellbore liquids in propellant-based fracturing (M30 and M5), 11:29251 (R;US)
PROPENE
See PROPYLENE
PROPORTIONAL COUNTERS
See also MULTIWIRE PROPORTIONAL CHAMBERS
Computer-Aided Design
A new type of REM measuring instrument, 11:30440 (J;US)
Physical Radiation Effects
Position detection of 17-25 keV x-rays in krypton and xenon with a resolution of 18-50μm (FWHM), 11:30459 (J;US)
PROPYLENE
Hydrogenation
Supported f-element complexes: surface chemistry and catalysis. Final report, August 15, 1984-January 14, 1986, 11:30195 (R;US)
Pyrolysis
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
PROTACTINIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
PROTECTIVE COATINGS
Optical Properties
Thin film coatings for improved alpha/epi, 11:29542 (RA;US)
PROTEINS
See also LIPOPROTEINS
PEPTIDES
PHYTOCHROMES
RHODOPSIN
Bioassay
Enzymatic assay for calmodulins based on plant NAD kinase activity, 11:30640 (J;US)
Biosynthesis
Proteins associated with adaptation of cultured tobacco cells to NaCl, 11:30644 (J;US)
Complexes
Analysis of photosynthetic antenna function in a mutant of Arabidopsis thaliana (L.) lacking trans-hexadecenoic acid, 11:30630 (J;US)
Molecular Structure
Cellular automata in cytoskeletal lattices, 11:30639 (J;NL)
Molecular Weight
Comparison of chromatographic characteristics of a series of homologous Bence-Jones proteins during size-exclusion chromatography by high-performance liquid chromatography and by Sephadex, 11:30635 (J;NL)
Purification
Comparison of chromatographic characteristics of a series of homologous Bence-Jones proteins during size-exclusion chromatography by high-performance liquid chromatography and by Sephadex, 11:30635 (J;NL)
PROTEOLIPIDS
See LIPOPROTEINS
PROTON DETECTION
Breakup Reactions
Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
Drift Chambers
New focal plane detector for the magnet spectrometer Big Karl, 11:30480 (J;NL)
Plastic Scintillation Detectors
Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
Position Sensitive Detectors
Segmented position-sensitive plastic phoswich detector, 11:30482 (J;NL)
PROTON REACTIONS
Charge-Exchange Reactions
Neutron polarimeter for (p, n) measurements at intermediate energies, 11:30487 (J;NL)
PROTON SPECTRA
Spectra Unfolding
Analysis of doublet proton spectra from laser implosion experiments, 11:31256 (J;US)
PROTON-ANTIPROTON INTERACTIONS
Particle Production
How to search for new particles at anti pp colliders, 11:30847 (BA;US)
Quantum Chromodynamics
QCD prediction for charmonium production in anti pp collisions, 11:30878 (BA;US)
PROTON-PROTON INTERACTIONS
Inclusive Interactions
Inclusive production of strange particles in 360 GeV/c PP interactions, 11:30825 (R;ES;In Spanish)
Particle Production
Inclusive production of strange particles in 360 GeV/c PP interactions, 11:30825 (R;ES;In Spanish)
PROTONS
See also COSMIC PROTONS
Decay
Proton decay in grand unified theories, 11:30868 (RA;JP)
Energy Losses
Analysis of doublet proton spectra from laser implosion experiments, 11:31256 (J;US)
Hadronic Particle Decay
Proton decay via d=5 gluino dressed graphs with flavour diagonal gluino couplings in supergravity models, 11:30859 (R;XA)
Interatomic Distances
Zero-field NMR of solid bis(μ-hydrido)decacarbonyltriosmium, 11:30203 (J;US)
Lifetime
Grand unification mass scale and proton life time in SO(10) model, 11:30883 (RA;JP)
Proton decay via d=5 gluino dressed graphs with flavour diagonal gluino couplings in supergravity models, 11:30859 (R;XA)
Meetings
Proceedings of the workshop on 'monopoles and proton decay', 11:30822 (R;JP)
Particle Decay
Proton decay: theory versus experiment, 11:30877 (R;AT)
Weak Particle Decay
Issues in monopole-catalyzed proton decay, 11:30870 (RA;JP)
Proton decay in supersymmetric models, 11:30871 (RA;JP)
PROTOPLASTS
See PLANT CELLS
PSI-3105 RESONANCES
Hadronic Particle Decay
DM2 results on hadronic and radiactive J/psi decays, 11:30837 (R;FR)
DM2 results on J/psi decays, 11:30839 (R;FR)
Selected results on J/psi hadronic decays from DM2 and Mark III, 11:30840 (R;FR)
Radiative Decay
DM2 results on hadronic and radiactive J/psi decays, 11:30837 (R;FR)
DM2 results on J/psi decays, 11:30839 (R;FR)

PUBLIC BUILDINGS
Energy Consumption
Electricity use in the public sector - a few examples from Denmark, 11:29962 (RA;US)
Power Demand
Electricity use in the public sector - a few examples from Denmark, 11:29962 (RA;US)
Space Heating
Analyzing the applicability of black coal in public buildings of the Ruhr District, 11:30012 (R;DE;In German)
PUBLIC UTILITIES
See also ELECTRIC UTILITIES
Planning
Utility perspective on commercial sector markets, 11:29970 (RA;US)
PULMONARY LAVAGE
See LUNGS
PULPS
See SLURRIES
PULSE DISCRIMINATORS
Design
A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers, 11:30471 (J;US)
PULSE GENERATORS
Electrical Insulation
Stripline insulation design analysis by partial discharge measurements, 11:29564 (R;US)
PULSE SHAPERS
Design
A surface mount amplifier-shaper-discriminator and preamplifier for the Fermilab CDF tracking chambers, 11:30471 (J;US)
Raman accumulator as fusion laser driver, 11:30504 (P;US)
PULSE STRETCHERS
See PULSE SHAPERS
PULSED FUSION REACTORS
Coolants
Fragmentation of suddenly heated liquids in ICF reactors, 11:31189 (J;US)
Design
Compact inertial confinement fusion multireactor concepts, 11:31224 (J;US)
Feasibility Studies
Compact inertial confinement fusion multireactor concepts, 11:31224 (J;US)
Inertial Confinement
Compact inertial confinement fusion multireactor concepts, 11:31224 (J;US)
Steam Turbines
Effects of pulsed operation on the lifetime of turbine rotors, 11:31253 (J;US)
PULVERIZED FUEL ASH
See FLY ASH
PUMPED LIMITERS
Design
A new concept for pumping the edge plasma, 11:31237 (J;US)
Engineering design of the ALT-II pump limiter for TEXTOR, 11:31251 (J;US)
Impurity control and vacuum pumping system design and analysis for next-generation tokamaks, 11:31153 (J;US)
Neutral pumping rates for a next step tokamak ignition device, 11:31235 (J;US)
Performance
Impurity control and vacuum pumping system design and analysis for next-generation tokamaks, 11:31153 (J;US)
Neutral pumping rates for a next step tokamak ignition device, 11:31235 (J;US)
Vacuum Pumps
Impurity control and vacuum pumping system design and analysis for next-generation tokamaks, 11:31153 (J;US)
PUMPS
Performance
Pulsatile fluidic pump demonstration and predictive model application, 11:29295 (R;US)
Seals
Shape memory alloy seals for geothermal applications, 11:29637 (R;US)
PUREX PROCESS
Flowsheets
Acid-split flowsheets for uranium-plutonium partitioning without a reductant, 11:29293 (R;US)
PURITY
See IMPURITIES
PWR TYPE REACTORS
See also ARDENNES B-1 REACTOR
ARKANSAS-1 REACTOR
BEAVER VALLEY-2 REACTOR
CALVERT CLIFFS-1 REACTOR
DAVIS BESSE-1 REACTOR
LOFT REACTOR
OCONEE-1 REACTOR
PALO VERDE-2 REACTOR
SOUTH TEXAS PROJECT-1 REACTOR
SOUTH TEXAS PROJECT-2 REACTOR
THREE MILE ISLAND-2 REACTOR
Containment Systems
Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501, 11:29855 (R;US)
Tellurium behavior in containment under light water reactor accident conditions, 11:29856 (R;US)
ECCS
Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)
Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 1, 11:29840 (R;FR)
Studies on the effects of blockage upon LWR emergency core cooling systems. Vol. 2, 11:29841 (R;FR)
Fuel Assemblies
Field tests and examinations in cell of French fuel assemblies, 11:29758 (R;FR;In French)
FRAMATOME studies on high conversion water reactor concept, 11:29769 (R;FR)
Structural analysis of PWR fuel assemblies in LOCA and seismic conditions, 11:29770 (R;FR)
Fuel Cans
Welding of sule elements for nuclear reactors with solid state YAG laser using instrumentated testing equipments, 11:30075 (R;FR;In French)
Fuel Element Clusters
Experimental investigation of the effect of clad ballooning on the effectiveness of PWR emergency cooling, 11:29839 (R;FR)
In Core Instruments
In-core measurements with platinum self powered detectors in a French PWR, 11:29756 (R;FR)
Loss of Coolant
Analysis of zircaloy rewetting experiments and their implication for reactor fuel, 11:29838 (R;FR)
Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility, 11:29844 (R;US)
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Heat transfer to a dispersed two phase flow and detailed quench front velocity research, 11:29836 (R;FR)
Study of two-dimensional effects in the core of a light water reactor during the ECC'S phase following a loss of coolant accident, 11:29837 (R;FR)
Materials Handling Equipment
Assessment of spent nuclear fuel shipping cask handling capabilities of commercial light water reactors, 11:29304 (R;US)
Mixed Oxide Fuels
Demonstration of spent-fuel measurement equipment at KWO Obrigheim facility, 11:29766 (R;FR)
Modifications
Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)
Nuclear Fuels
Department of Energy extended burnup data base. Final report, 11:29749 (R;US)
Design and final safety analysis report for vertical fission product release apparatus in hot Cell B, Building 4501, 11:29855 (R;US)

Effects of time and other variables on fission product release rates, 11:29748 (R;US)
Pipes
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
Pressure Vessels
Historical summary of the heavy-section steel technology program and some related activities in light-water reactor pressure vessel safety research, 11:29859 (R;US)
Light Water Reactor Pressure Vessel Surveillance Dosimetry Improvement Program. PSF Blind Test workshop minutes. Summary, 11:29750 (R;US)
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
Radiation Doses
Cost-effectiveness studies as part of an ALARA program, 11:29830 (R;US)
Reactor Accidents
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
Tellurium behavior in containment under light water reactor accident conditions, 11:29856 (R;US)
Reactor Cooling Systems
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Reactor Cores
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Reactor Decommissioning
Intact decommissioning of nuclear power plants: a dose assessment, 11:29747 (R;US)
Reactor Internals
Maintenance and repair tools of the 900 MW PWR units in France, 11:29771 (R;FR;In French)
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
Reactor Safety
Hydrogen:air:steam flammability limits and combustion characteristics at intermediate scale, 11:29861 (R;US)
Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)
Reactor Technology
FRAMATOME PWR technological development, 11:29767 (R;FR)
Regulations
Review of light water reactor regulatory requirements. Identification of regulatory requirements that may have marginal importance to risk. Volume 1, 11:29753 (R;US)
Research Programs
French study and research program on water cooled reactor safety, 11:29757 (R;FR;In French)
Risk Assessment
Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
Steam Generators
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
Steam generator replacement, 11:29772 (R;FR)
Systems Analysis
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
PYRANOMETERS
Calibration
Pyranometer comparison at INPE, Atibaia, in August 1983, 11:30497 (R;BR)
PYRENE
Chemical Preparation
Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)
Isomerization
Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)
Labelling
Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)
PYRHELIOMETERS
Calibration
Pyranometer comparison at INPE, Atibaia, in August 1983, 11:30497 (R;BR)
PYRIDINE
Solvent Properties
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)
2-PYRIDINECARBOXYLIC ACID
See PICOLINIC ACID
PYRIDINES
See also BIPYRIDINES
PYRIDINE
QUINOLINES
Chemical Reaction Kinetics
Kinetics and mechanisms of electron transfer between blue copper proteins and electronically excited chromium and ruthenium polypyridine complexes, 11:30292 (J;US)
Metabolism
In vivo studies of pyridine nucleotide metabolism in Escherichia coli and Saccharomyces cerevisiae by carbon-13 NMR spectroscopy, 11:30655 (J;US)
Photolysis
Laser flash photolytic determination of triplet yields via singlet oxygen generation, 11:30297 (J;CH)
Pyrolysis
Pyrolysis of model alkyl pyridine compounds, 11:29274 (BA;US)
PYROLYSIS
Yields
Production of a high-quality liquid fuel from coal by mild pyrolysis of coal-lime mixtures, 11:29158 (R;US)
2-PYRROLIDINECARBOXYLIC ACID
See PROLINE

Q

QUARK-ANTIQUARK INTERACTIONS
Potentials
SVZ, gluon condensate and potential models, 11:30876 (R;AT)
QUARKS
Fermi Statistics
Statistical principle and the quarks, 11:30863 (R;BR)
Mass Formulae
Mass hierarchies of quarks and leptons in a supersymmetric SP(2N) subcolor theory, 11:30864 (R;JP)
Particle Identification
How to search for new particles at anti pp colliders, 11:30847 (BA;US)
Particle Production
How to search for new particles at anti pp colliders, 11:30847 (BA;US)
QUASARS
See also BLUE STELLAR OBJECTS

Cosmic Ray Flux
Blazars, quasars and starbursts, 11:30800 (RA;GB)
QUASI-ELASTIC SCATTERING
Lectures
Heavy ion induced fusion/fission and barrier penetration. Lecture notes, 11:30929 (R;AU)
QUEENSLAND
Oil Shale Deposits
Pyrolysis of oil shale in supercritical toluene reaction mechanism and role of hydrogen, 11:29271 (BA;US)
QUINOLINES
Crystal Structure
Structure and spectral properties of a squarylium dye, 2,4-bis[(1-n-butyl-2(1H)-quinolylidene)methyl]-1,3-cyclobutadienediylium-1,3-diolate, 11:30241 (J;US)
Denitrification
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
Hydrogenation
Composite-bed reactor for upgrading coal-derived liquids. Quarterly report No. 10 for the period January 1-March 31, 1986, 11:29159 (R;US)
Phase Studies
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
Vapor Pressure
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
Visible Spectra
Structure and spectral properties of a squarylium dye, 2,4-bis[(1-n-butyl-2(1H)-quinolylidene)methyl]-1,3-cyclobutadienediylium-1,3-diolate, 11:30241 (J;US)
QUINONES
Luminescence
Luminescence of 1,4-naphthoquinone and the vitamin K system in Shpolskii matrices at 4 K, 11:30275 (J;GB)
Photochemistry
Luminescence of 1,4-naphthoquinone and the vitamin K system in Shpolskii matrices at 4 K, 11:30275 (J;GB)

R

R CODES
Revision of Primary Standards Laboratory's methods to calculate water vapor pressures (ENHANC, RH, RHTAB), 11:31286 (R;US)
RABBITS
Contamination
Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington, 11:30585 (J;NL)
RACIAL GROUPS
See MINORITY GROUPS
RACKS (FUEL)
See FUEL RACKS
RADIATION ACCIDENTS
Ethical Aspects
Science, technology, and society, 11:30735 (R;US)
Health Hazards
Early occurring and continuing effects, 11:29447 (RA;US)
Genetic effects, 11:29449 (RA;US)
Late somatic effects, 11:29448 (RA;US)
Risk Assessment
Science, technology, and society, 11:30735 (R;US)
RADIATION DECONTAMINATION
See DECONTAMINATION
RADIATION DETECTORS
See also CHERENKOV COUNTERS
NEUTRON DETECTORS
POSITION SENSITIVE DETECTORS
PROPORTIONAL COUNTERS
RADIOMETERS
SCINTILLATION COUNTERS
SEMICONDUCTOR DETECTORS
SHOWER COUNTERS
TISSUE-EQUIVALENT DETECTORS
Cryostats
A reliable automatic liquid nitrogen filling system, 11:30429 (J;US)
Damaging Neutron Fluence
Picosecond photoconductors as radiation detectors, 11:30427 (J;US)
Data Acquisition Systems
A sophisticated gamma-ray data acquisition system based on an IBM PC/XT computer, 11:30437 (J;US)
Design
High range gamma radiation meter, 11:30434 (J;US)
Picosecond photoconductors as radiation detectors, 11:30427 (J;US)
Fabrication
Picosecond photoconductors as radiation detectors, 11:30427 (J;US)
Fastbus System
FASTBUS review 1985, 11:30435 (J;US)
Integrated Circuits
Introduction to semi-custom integrated circuits, 11:30436 (J;US)
Interactive Display Devices
A low-cost general purpose spectral display unit using an IBM PC, 11:30438 (J;US)
Multi-Channel Analyzers
A low-cost general purpose spectral display unit using an IBM PC, 11:30438 (J;US)
Performance
High range gamma radiation meter, 11:30434 (J;US)
Photoconductors
Picosecond photoconductors as radiation detectors, 11:30427 (J;US)
RADIATION DOSIMETRY
See DOSIMETRY
RADIATION MONITORS
Accuracy
Earth Radiation Budget Experiment (ERBE) scanner instrument anomaly investigation, 11:30426 (R;US)
Computerized Control Systems
Stack monitor for the proof-of-breeding project, 11:30431 (J;US)
Performance Testing
Emergency containment system, 11:29439 (RA;US)
RADIATION TRANSPORT
Mathematical Models
Radiation transport. Progress report, April 1, 1985-June 30, 1985, 11:29795 (R;US)
Research Programs
Radiation transport. Progress report, April 1, 1985-June 30, 1985, 11:29795 (R;US)
RADIATORS
Limited to heat radiators.
Design
Magnetically focused liquid drop radiator, 11:30404 (P;US)
RADICALS
Not to be used for compound descriptions.
See also ALKYL RADICALS
ARYL RADICALS
HYDROPEROXY RADICALS
HYDROXYL RADICALS
PEROXY RADICALS
Absorption Spectroscopy
Transient phenomena in the pulse radiolysis of retinyl polyenes. 4. Environmental effects on absorption maximum of retinal radical anion, 11:30302 (J;US)
Chemical Preparation
Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)
Chemical Reaction Kinetics
Transient phenomena in the pulse radiolysis of retinyl polyenes. 4. Environmental effects on absorption maximum of retinal radical anion, 11:30302 (J;US)

Decomposition
Thermodynamic and kinetic properties of the cyclohexadienyl radical, 11:30243 (J;US)
Electron Spin Resonance
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Radiolysis
Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)

RADIO EQUIPMENT
Interference
Improving security communications at fixed-site facilities, 11:29454 (R;US)
Maintenance
Improving security communications at fixed-site facilities, 11:29454 (R;US)

RADIO RECEIVERS
See RADIO EQUIPMENT

RADIO TRANSMITTERS
See RADIO EQUIPMENT

RADIOACTIVE AEROSOLS
Aerosol Monitoring
A transuranic-aerosol-measurement system for the workplace or stack monitoring, 11:30432 (J;US)
Air Pollution Control
Evaluation of chemical stabilizers and windscreens for wind erosion control of uranium mill tailings, 11:30557 (RA;US)
Chemical Preparation
Dissolution of uranium oxide materials in simulated lung fluid, 11:30309 (RA;US)
Deposition
Dry deposition model sensitivity, 11:30561 (RA;US)
Dissolution
Dissolution of uranium oxide materials in simulated lung fluid, 11:30309 (RA;US)
Precipitation Scavenging
Evaluation of the expected uncertainty in precipitation scavenging rates for effluents resulting from a nuclear reactor accident, 11:30562 (RA;US)
Radiation Hazards
Dissolution of uranium oxide materials in simulated lung fluid, 11:30309 (RA;US)
Removal
Coupling of aerosol removal mechanisms in rising bubbles, 11:29813 (R;US)

RADIOACTIVE BIOLOGICAL WASTES
See RADIOACTIVE WASTES

RADIOACTIVE EFFLUENTS
Isotope Ratio
The determination of deuterium and tritium in effluent wastewater by pulsed nuclear magnetic resonance spectroscopy, 11:31101 (J;US)

RADIOACTIVE GASEOUS WASTES
See GASEOUS WASTES
RADIOACTIVE WASTES

RADIOACTIVE MATERIALS
See also FISSION PRODUCTS
RADIOACTIVE WASTES
Air Transport
Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)
Maritime Transport
Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)
Rail Transport
Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Road Transport
Radioactive Material (RAM) transportation accident/incident analysis, 11:29305 (R;US)
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Spectrophotometry
Fiber optic modification of a diode array spectrophotometer, 11:30496 (R;US)

RADIOACTIVE PARTICULATES
See PARTICLES
RADIOACTIVE AEROSOLS

RADIOACTIVE TRACERS
See TRACER TECHNIQUES

RADIOACTIVE WASTE DISPOSAL
Computerized Simulation
Version of ORIGEN2 with automated sensitivity-calculation capability, 11:29398 (R;US)
Environmental Impacts
Canadian nuclear fuel waste management program, 11:29314 (R;CA)
Meetings
Scientific basis for nuclear waste management IX, 11:29420 (B;US)
Remote Handling Equipment
Development and use of a remote waste handling system for disposal of greater confinement wastes, 11:29327 (RA;US)
Research Programs
Canadian nuclear fuel waste management program, 11:29314 (R;CA)
Sealing Materials
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
Site Selection
Geologic considerations in UMTRA Project alternate site selection process, 11:29325 (RA;US)
Waste Forms
Fuel characterization research for the Canadian Nuclear Fuel Waste Management Program, 11:29315 (R;CA)

RADIOACTIVE WASTE FACILITIES
See also WIPP
Modularized system for disposal of low-level radioactive waste, 11:29342 (RA;US)
Project management of radwaste retrofits, 11:29810 (RA;US)
Comparative Evaluations
Comparison of low-level radioactive waste management alternatives, 11:29335 (RA;US)
Computerized Simulation
Simulation of the MRS receiving and handling facility, 11:29423 (BA;US)
Design
Design of a modular radwaste facility, 11:29355 (RA;US)
Economics
Low-level volume reduction services facility, 11:29348 (RA;US)
Liquid Wastes
Estimates of secondary waste production from operations at a proespective geologic repository in tuff, 11:29393 (RA;US)
Modifications
Modification of an existing radwaste facility to provide onsite low level waste storage, 11:29368 (RA;US)
Operation
Operational procedures for receiving, packaging, emplacing, and retrieving high-level and transuranic waste in a geologic repository in tuff (NNWSI project), 11:29417 (R;US)
Performance
Operational experience of the Palisades volume reduction system: the first 12 months, 11:29387 (RA;US)
Regional Cooperation
Commercial regional incinerator facility for treatment of low-level radioactive waste, 11:29385 (RA;US)
Remedial Action
Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual, 11:29450 (R;US)
Remote Handling Equipment
Use of robotics for radioactive waste shipping and receiving, 11:29307 (R;US)
Site Characterization
Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual, 11:29450 (R;US)

Site Selection
Local government participation in the siting of a low-level radioactive waste disposal facility: the Texas experience, 11:29319 (RA;US)
Solid Wastes
Estimates of secondary waste production from operations at a proespective geologic repository in tuff, 11:29393 (RA;US)

RADIOACTIVE WASTE MANAGEMENT
Compact Commissions
Public Law 99-240: an act to amend the low-Level Radioactive Waste Policy Amendments Act of 1985. Introduced in the Senate and House of Representatives of the United States of America in Congress assembled, Ninety-Ninth Congress, January 15, 1986, 11:29419 (B;US)
Cost
New York State interim waste management cost evaluation, 11:29323 (RA;US)
Meetings
Scientific basis for Nuclear Waste Management VIII, 11:29428 (B;US)
Waste Management '85: Waste Isolation in the US - Technical Programs and Public Education. Volume 2. Waste policies and programs, low-level waste, 11:29317 (R;US)
Regional Cooperation
Public Law 99-240: an act to amend the low-Level Radioactive Waste Policy Amendments Act of 1985. Introduced in the Senate and House of Representatives of the United States of America in Congress assembled, Ninety-Ninth Congress, January 15, 1986, 11:29419 (B;US)

RADIOACTIVE WASTE PROCESSING
See also IODOX PROCESS
Equipment
Mobile liquid VR system: a cost effective alternative, 11:29349 (RA;US)
Ion Exchange
Development of sphene-based glass-ceramics for disposal of some Canadian wastes, 11:29427 (J;US)
Mobile Reactors
Design, manufacturing and commissioning of mobile unit for EDF (Dow Chemical process), 11:29358 (RA;US)
Personnel
Revised worker exposure estimates for TMI-2 radioactive waste processing and decontamination, 11:29442 (RA;US)
Portable Equipment
Mobile solidification system interface design considerations, 11:29369 (RA;US)
Testing and operation of a transportable volume reduction unit, 11:29363 (RA;US)
Research Programs
Waste Systems progress report, March 1984-February 1985, 11:29413 (R;US)

RADIOACTIVE WASTE STORAGE
See also MONITORED RETRIEVABLE STORAGE
Survey and assessment of radioactive waste management facilities in the United States. Section 2.5. Air-cooled vault storage facilities, 11:29299 (R;US)
Performance
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Risk Assessment
Geologic disposal of high-level radioactive wastes: Earth-science perspectives, 11:29401 (R;US)
Simulation
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Site Selection
Geologic disposal of high-level radioactive wastes: Earth-science perspectives, 11:29401 (R;US)
Underground Storage
Geologic disposal of high-level radioactive wastes: Earth-science perspectives, 11:29401 (R;US)

RADIOACTIVE WASTES
See also ALPHA-BEARING WASTES
HIGH-LEVEL RADIOACTIVE WASTES
INTERMEDIATE-LEVEL RADIOACTIVE WASTES
LOW-LEVEL RADIOACTIVE WASTES
RADIOACTIVE EFFLUENTS
Information Systems
Data processing in the integrated data base for spent fuel and radioactive waste, 11:29421 (BA;US)
Inventories
Data processing in the integrated data base for spent fuel and radioactive waste, 11:29421 (BA;US)
Leaching
Leach testing of waste glasses under near-saturation conditions, 11:29429 (J;US)
Materials Handling
DOE approach to threshold quantities, 11:29332 (RA;US)
Quantitative Chemical Analysis
Modification of a commercially available ICP for application to radioactive analyses, 11:30506 (J;US)
Radioactive Waste Disposal
Modified hazard ranking system for sites with mixed radioactive and hazardous wastes. User manual (Mixed radioactive and hazardous wastes), 11:29450 (R;US)
Radioactivity
Chemical and physical consequences of α and β^- decay in the solid state, 11:29426 (J;US)
Radiolysis
Gas generation measurements on tritiated waste materials, 11:29438 (RA;US)
Rail Transport
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Road Transport
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Underground Disposal
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Qualitative comparisons of fusion reactor materials for waste handling and disposal, 11:31212 (J;US)
Underground Storage
Chemical and physical consequences of α and β^- decay in the solid state, 11:29426 (J;US)
Waste Transportation
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)

RADIOCARBON DATING
See CARBON 14
ISOTOPE DATING

RADIODIAGNOSIS (RADIONUCLIDES)
See NUCLEAR MEDICINE

RADIOFREQUENCY SYSTEMS
See RF SYSTEMS

RADIOGRAPHY (BIOMEDICAL)
See BIOMEDICAL RADIOGRAPHY

RADIOGRAPHY (INDUSTRIAL)
See INDUSTRIAL RADIOGRAPHY

RADIOISOTOPE BATTERIES
Cost
Interplanetary exploration-A challenge for photovoltaics, 11:29456 (RA;US)

RADIOISOTOPE MIGRATION
See RADIONUCLIDE MIGRATION

RADIOISOTOPES
See also NEUTRON-DEFICIENT ISOTOPES
NEUTRON-RICH ISOTOPES
Radioecological Concentration
Radiation exposure rates and radionuclide concentrations in soil around the Argonne National Laboratory-West Site, 11:30581 (R;US)

RADIOMETERS
Configuration
Microwave limb sounder for stratospheric measurements, 11:30181 (R;US)

RADIONUCLIDE MIGRATION
In environment.
Waste management practices to control biological transport of radioactivity at the Hanford Site, 11:29434 (RA;US)
Computerized Simulation
Relevance of biotic pathways to the long-term regulation of nuclear waste disposal. Estimation of radiation dose to man

resulting from biotic transport: the BIOPORT/MAXI1 software package. Volume 5, 11:29446 (R;US)
Mathematical Models
Contribution to the study of radioactive and heavy jets discharged in the presence of a cross-stream, 11:30560 (R;FR;In French)
RADIONUCLIDE TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION
RADIONUCLIDES
See RADIOISOTOPES
RADIOSENSITIZERS
Teratogenesis
Axial skeleton malformations induced by 5 fluoro-2'-desoxycytidine (FCdR) and X-rays in mice of the breeding strains C57Bl/6JHanFfm, C57Bl/10JFfm, and in hamsters of the GHFfm breeding strain. A comparative evaluation considering gestation stages and dose-response-relationships, 11:30692 (R;DE;In German)
RADIOSURGERY
See RADIOTHERAPY
RADIOTHERAPY
Electron Beams
Variations of dose distribution in high energy electron beams as a function of geometrical parameters of irradiation. Application to computer calculation, 11:30664 (R;FR;In French)
RADIOTHORIUM
See THORIUM 228
RADIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
RADIUM 226
Radioecological Concentration
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Tissue Distribution
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
RADIUM 228
Radioecological Concentration
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Tissue Distribution
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
RADON
Air Pollution Monitoring
Some measurements of the equilibrium factor for radon daughters in houses, 11:30556 (RA;US)
Radioecological Concentration
Preliminary radon testing results for the Residential Standards Demonstration Program. Program results No. 3, 11:29905 (R;US)
Some measurements of the equilibrium factor for radon daughters in houses, 11:30556 (RA;US)
RADON 210
Energy Levels
Short lived isomers in ^{211}Rn and ^{210}Rn, 11:30920 (R;AU)
Gyromagnetic Ratio
G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
High Spin States
G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
Isomeric Nuclei
Short lived isomers in ^{211}Rn and ^{210}Rn, 11:30920 (R;AU)
RADON 211
Energy Levels
Short lived isomers in ^{211}Rn and ^{210}Rn, 11:30920 (R;AU)
Gyromagnetic Ratio
G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
High Spin States
G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
Isomeric Nuclei
Short lived isomers in ^{211}Rn and ^{210}Rn, 11:30920 (R;AU)
RADON 212
Gyromagnetic Ratio
G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
High Spin States
G-factors in ^{210}Rn and octupole coupling of core excited states in ^{210}Rn, ^{211}Rn and ^{212}Rn, 11:30921 (R;AU)
RAIL TRANSPORT
Computerized Simulation
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
RAILGUN ACCELERATORS
Design
Reconnection gun, 11:30352 (R;US)
Energy Recovery
Counterpulse railgun energy recovery circuit, 11:30400 (P;US)
Pulse Techniques
Counterpulse railgun energy recovery circuit, 11:30400 (P;US)
RAIN
See also ACID RAIN
Chemical Composition
Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States, 11:30524 (R;US)
RAMAN EFFECT
Molecular Models
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Time Dependence
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
RAMAN SPECTROSCOPY
Prior to March 1983 this concept was indexed to RAMAN SPECTRA.
Light Scattering
Raman accumulator as fusion laser driver, 11:30504 (P;US)
RAMJET ENGINES
Supersonic Flow
Investigation of chemically-reacting supersonic internal flows. Progress report, 11:30034 (R;US)
RARE EARTH COMPOUNDS
See also EUROPIUM COMPOUNDS
LANTHANUM COMPOUNDS
Crystal Structure
Partial structure-field map for $A^{3+}B^{5+}O_4$ compounds, 11:30135 (J;NL)
Solubility
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)
Thermodynamic Properties
Desolvation energies for rare-earth-metal perchlorate, chloride, and nitrate electrolytes from 0.1 m to saturation, 11:30218 (J;US)
RARE EARTH ISOTOPES
Moessbauer Effect
Rare-earth Moessbauer studies on chemical problems, 11:30228 (BA;US)
RAS AL KHAIMA
See UNITED ARAB EMIRATES
REACTION INTERMEDIATES
Adsorption
Surface-enhanced resonance Raman study of the photoreduction of methylviologen on a p-InP semiconductor electrode, 11:30285 (J;US)
REACTION PRODUCT TRANSPORT SYSTEMS
On-Line Measurement Systems
Stopped-flow technique for transit time measurement in a gas jet, 11:29804 (J;NL)

Time Measurement
Stopped-flow technique for transit time measurement in a gas jet, 11:29804 (J;NL)

REACTOR ACCIDENTS
See also LOSS OF COOLANT
ROD DROP ACCIDENTS
Fluid-Structure Interactions
Independent analysis of selected core-concrete interaction and fission product release experiments with CORCON-MOD2 and VANESA, 11:29829 (R;US)
Simulation
Analysis of zircaloy rewetting experiments and their implication for reactor fuel, 11:29838 (R;FR)

REACTOR COMPONENTS
See also BREEDING BLANKETS
FUEL ELEMENTS
REACTOR COOLING SYSTEMS
REACTOR CORES
REACTOR INTERNALS
Design
Elasto-plastic benchmark calculations. Step 1: verification of the numerical accuracy of the computer programs, 11:31278 (R;FR)

REACTOR CONTROL SYSTEMS
Design
Description of a research reactor control system using a programmable controller, 11:29817 (R;US)
State and data techniques for control of discontinuous systems, 11:29809 (R;US)
Testing
Description of a research reactor control system using a programmable controller, 11:29817 (R;US)

REACTOR COOLING SYSTEMS
See also PRIMARY COOLANT CIRCUITS
Heat Transfer
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Hydraulics
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Monitoring
Review of the OECD specialist meeting on continuous monitoring techniques for assuring coolant circuit integrity, 11:29870 (J;US)

REACTOR CORES
See also COUPLED REACTOR CORES
Design
High flux research reactors based on particulate fuel, 11:29784 (R;US)
Fuel Elements
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Heat Transfer
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)
Hydraulics
Fluid-dynamic effects in the fuel element top nozzle area during refilling and reflooding, 11:29842 (R;FR)

REACTOR DISMANTLING
Explosive Fracturing
Study of explosive demolition techniques for heavy reinforced and prestressed concrete structures, 11:29835 (R;FR)
Feasibility Studies
Study of explosive demolition techniques for heavy reinforced and prestressed concrete structures, 11:29835 (R;FR)

REACTOR FUEL ELEMENTS
See FUEL ELEMENTS

REACTOR FUELS
See NUCLEAR FUELS

REACTOR INSTRUMENTATION
See also IN CORE INSTRUMENTS
Testing
Qualification testing evaluation (QTE) program, FIN A-1051, Case 0686. Bimonthly status report, February-March 1986, 11:29797 (R;US)

REACTOR INTERNALS
Crack Propagation
Proceedings of the second International Atomic Energy Agency specialists' meeting on subcritical crack growth. Sessions I and II. Volume 1, 11:29751 (R;US)
Second International Atomic Energy Agency Specialists' meeting on subcritical crack growth: proceedings. Sessions III and IV. Volume 2, 11:29752 (R;US)
Repair
Maintenance and repair tools of the 900 MW PWR units in France, 11:29771 (R;FR;In French)

REACTOR LATTICES
Multiplication Factors
HECTOR measurements on plutonium-uranium metal fuel, 11:29815 (R;GB)
Reactivity
HECTOR measurements on plutonium-uranium metal fuel, 11:29815 (R;GB)
Reactivity change measurements on plutonium uranium oxide fuel clusters in a plutonium uranium metal lattice in HECTOR, 11:29814 (R;GB)

REACTOR MAINTENANCE
Human Factors Engineering
Recommendations to the NRC on human engineering guidelines for nuclear power plant maintainability, 11:29852 (R;US)

REACTOR MATERIALS
To be assigned in conjunction with the specific descriptor for the material used in a reactor, provided this descriptor is not yet up-posted to reactor materials.
See also NUCLEAR FUELS
Fracture Properties
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Physical Radiation Effects
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)

REACTOR OPERATION
Data Compilation
Licensed operating reactors. Status summary report, data as of February 28, 1986. Volume 10, No. 3, 11:29789 (R;US)
Human Factors
Investigation of the contributors to wrong unit or wrong train events, 11:29849 (R;US)
Transients
Model for LMFBR core transient analysis in real-time, 11:29779 (R;US)
Plant analyzer development for high-speed interactive simulation of BWR plant transients, 11:29828 (R;US)

REACTOR PROTECTION SYSTEMS
See also ECCS
Seismic Effects
Seismic and dynamic qualification of safety related electrical and mechanical equipment, 11:29850 (R;US)

REACTOR SAFETY
Evaluation
Scoping study of the potential effectiveness of an operational safety reliability program in addressing generic safety problems, 11:29860 (R;US)
Reliability
Comparison of three methods for calculating lower confidence limits on system reliability using binomial component data, 11:29876 (J;US)
Research Programs
French study and research program on water cooled reactor safety, 11:29757 (R;FR;In French)
Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)
Reactor safety research: visible demonstrations and credible computations, 11:29868 (J;US)

REACTOR SAFETY EXPERIMENTS
Loss of Coolant
Analysis of zircaloy rewetting experiments and their implication for reactor fuel, 11:29838 (R;FR)
REACTORS
See also LIQUID METAL COOLED REACTORS
MOBILE REACTORS
POWER REACTORS
PRODUCTION REACTORS
Environmental Effects
Division of Stress and Wildlife Ecology FY-1985 highlights, 11:30570 (RA;US)
READOUT SYSTEMS
Design
Design and performance of a CCD based readout for the DELPHI barrel electromagnetic calorimeter, 11:30467 (J;US)
Performance
Design and performance of a CCD based readout for the DELPHI barrel electromagnetic calorimeter, 11:30467 (J;US)
RECEPTORS
Distribution
Effect of preferential insertion of LDL receptors near coated pits, 11:30636 (J;US)
RECIPROCAL TRANSLOCATIONS
See CHROMOSOMAL ABERRATIONS
RECLAMATION
See LAND RECLAMATION
RECOVERY (TRITIUM)
See TRITIUM RECOVERY
REDUCTASES
See OXIDOREDUCTASES
REFRACTORIES
Corrosion
Corrosion of materials by high-temperature industrial combustion environments: a summary, 11:30124 (R;US)
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Erosion
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
REFRIGERANTS
Circulating Systems
Vertical recirculation-type evaporators. An investigation of heat transfer and refrigerant circulation, 11:29989 (R;SE;In Swedish)
Thermodynamics
Secondary refrigerants for heat pump applications. Studies of thermodynamic properties and corrosion, 11:29990 (R;SE;In Swedish)
REFRIGERATORS
See also HELIUM DILUTION REFRIGERATORS
MAGNETIC REFRIGERATORS
THERMOELECTRIC REFRIGERATORS
Absorption Refrigeration Cycle
Absorption machine with desorber-resorber, 11:30018 (P;US)
Director fired absorption machine flue gas recuperator, 11:30030 (P;US)
Design
Absorption machine with desorber-resorber, 11:30018 (P;US)
Energy Efficiency
Absorption machine with desorber-resorber, 11:30018 (P;US)
Flue Gas
Director fired absorption machine flue gas recuperator, 11:30030 (P;US)
REFUSE
See SOLID WASTES
REGION I
See FEDERAL REGION I
REGION V
See FEDERAL REGION V
REGION VI
See FEDERAL REGION VI
REGION VII
See FEDERAL REGION VII
REGION X
See FEDERAL REGION X
REINDEER
See DEER
REINFORCED CONCRETE
Experiences in development, qualification, and use of concrete high-integrity containers in commercial disposal of radioactive wastes, 11:29359 (RA;US)
Slabs
Global methods for reinforced concrete slabs, 11:30151 (R;FR)
REINFORCED MATERIALS
See also REINFORCED CONCRETE
Chemical Vapor Deposition
Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration, 11:30130 (BA;US)
Fabrication
Chemical vapor infiltration of fiber-reinforced ceramic composites, 11:30143 (R;US)
Development of a new, faster process for the fabrication of ceramic fiber-reinforced ceramic composites by chemical vapor infiltration, 11:30130 (BA;US)
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
RELEASE (FISSION PRODUCT)
See FISSION PRODUCT RELEASE
RELIC RADIATION
See RELICT RADIATION
RELICT RADIATION
Thermal microwave background radiation of the universe believed to date from the earliest moments of the universe.
Compton Effect
Sunyaev-Zeldovich effect at 1.15 mm wavelength, 11:30802 (RA;GB)
REMEDIAL ACTION
Documentation
Framework for resolving hazardous waste cleanup liability, 11:30593 (RA;US)
REMOTE AREAS
Power Systems
Overview of Australian lead/acid battery test programs, 11:29879 (RA;US)
REMOTE HANDLING EQUIPMENT
Use of remote systems and automation in radioactive waste shipping and receiving, 11:29306 (R;US)
Design
Development and use of a remote waste handling system for disposal of greater confinement wastes, 11:29327 (RA;US)
Funnel for fuel pin loading system, 11:29808 (P;US)
RENEWABLE ENERGY SOURCES
See also BIOMASS
GEOTHERMAL ENERGY
HYDROELECTRIC POWER
SOLAR ENERGY
WAVE POWER
Appraisal
Prospects for the exploitation of the renewable energy technologies in the United Kingdom, 11:29916 (R;GB)
REPUBLIC OF CHINA
See TAIWAN
REPUBLIC OF KOREA
Imports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
RESEARCH PROGRAMS
To be used jointly with descriptor(s) for subject field and/or organization concerned.
Aerodynamics
SERC support for research in wind energy, 11:29648 (RA;GB)
Wind Power
R and D on wind power in the CEGB, 11:29649 (RA;GB)
Wind Power Plants
Generic wind studies in the DEn programme, 11:29647 (RA;GB)
Wind Turbines
DTI support for commercial wind turbines, 11:29650 (RA;GB)

Priority areas for underlying research, 11:29652 (RA;GB)
R and D needs in wind energy - the manufacturers view, 11:29645 (RA;GB)
R and D needs in wind energy - a utility's view based on experience, 11:29646 (RA;GB)
R and D needs in wind energy, 11:29651 (R;GB)
R and D on wind power in the CEGB, 11:29649 (RA;GB)
SERC support for research in wind energy, 11:29648 (RA;GB)

RESEARCH REACTORS
See also BSR-1 REACTOR
BSR-2 REACTOR
FFTF REACTOR
HECTOR REACTOR
HFR REACTOR
SILENE REACTOR
SORA REACTOR
SPR-3 REACTOR
ZPPR REACTOR
Coated Fuel Particles
High flux research reactors based on particulate fuel, 11:29784 (R;US)
Coupled Reactor Cores
Versatile computer code for reactor neutronic calculation advances in qualification of the different modules, 11:29794 (R;FR;In French)
Reactor Cores
High flux research reactors based on particulate fuel, 11:29784 (R;US)

RESID
See PETROLEUM RESIDUES

RESIDENCES
See HOUSES

RESIDENTIAL BUILDINGS
See also APARTMENT BUILDINGS
HOUSES
Air Infiltration
Description of ASHRAE's proposed data tightness standard, 11:30000 (R;US)
Attached Greenhouses
Thermal measurements in greenhouses attached to residential buildings. Climatic conditions - occupants - thermal comfort, 11:30013 (R;DE;In German)
Construction
Use of geoclimatic data for the determination of building characteristics in the north of the Venezuelan Republic, 11:29598 (RA;US)
Contamination
Some measurements of the equilibrium factor for radon daughters in houses, 11:30556 (RA;US)
Cooling Load
Integration of passive and active solar strategies in buildings, 11:29568 (RA;US)
Design
Traditional methods for energy conservation in dwelling units, 11:30006 (RA;US)
Energy Conservation
Energy conservation and its implication for architectural design and town planning in the hot-arid areas of Saudi Arabia and the US Gulf States, 11:29589 (RA;US)
Measured results of energy conservation retrofits in residential buildings, 11:30004 (R;US)
Traditional methods for energy conservation in dwelling units, 11:30006 (RA;US)
Ground Source Heat Pumps
Residential earth-coupled heat pump demonstration. Final report, 11:30014 (R;US)
Heating Load
Integration of passive and active solar strategies in buildings, 11:29568 (RA;US)
Orientation
Desirable orientation and proportion of courtyards for Riyadh region, 11:29580 (RA;US)
Influence of orientation on the internal thermal environment of residential buildings in Riyadh, 11:29578 (RA;US)
Passive Solar Cooling Systems
Desirable orientation and proportion of courtyards for Riyadh region, 11:29580 (RA;US)
Integration of passive and active solar strategies in buildings, 11:29568 (RA;US)
Passive cooling in Mexico, Mexico City, 11:29596 (RA;US)
Passive-hybrid cooling and load avoidance in very hot climates, 11:29584 (RA;US)
Use of geoclimatic data for the determination of building characteristics in the north of the Venezuelan Republic, 11:29598 (RA;US)
Passive Solar Heating Systems
Integration of passive and active solar strategies in buildings, 11:29568 (RA;US)
Washington State Solar Bank Program. A comprehensive 1984-85 program evaluation, 11:29605 (R;US)
Retrofitting
Measured results of energy conservation retrofits in residential buildings, 11:30004 (R;US)
Solar Architecture
Energy conservation and its implication for architectural design and town planning in the hot-arid areas of Saudi Arabia and the US Gulf States, 11:29589 (RA;US)
Solar Cooling Systems
Daily thermal storage for heating and cooling of buildings, 11:29590 (RA;US)
Influence of orientation on the internal thermal environment of residential buildings in Riyadh, 11:29578 (RA;US)
Solar energy policies and the role of human settlements planner, 11:29583 (RA;US)
Solar-powered, fuel-assisted Rankine cycle and cooling system: King Abdulaziz University cooling project, 11:29567 (RA;US)
Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)
Solar Heating Systems
Daily thermal storage for heating and cooling of buildings, 11:29590 (RA;US)
Jordan's first solar-heated house, 11:29599 (RA;US)
Solar energy policies and the role of human settlements planner, 11:29583 (RA;US)
Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)
Solar Water Heating
Solar water heating - recent trends, cost, and performance, 11:29592 (RA;US)
Standards
Description of ASHRAE's proposed data tightness standard, 11:30000 (R;US)
Thermal Comfort
Thermal measurements in greenhouses attached to residential buildings. Climatic conditions - occupants - thermal comfort, 11:30013 (R;DE;In German)
Weatherization
Report brief. Category: evaluation and modeling, 11:30015 (R;US)

RESIDUAL OILS
See PETROLEUM RESIDUES

RESIDUES (RADIOACTIVE)
See RADIOACTIVE WASTES

RESINS
Deposition
Machine for applying a two component resin to a roadway surface, 11:30022 (P;US)
Radiolysis
Degradation of resins in EPICOR-II prefilters from Three Mile Island, 11:30154 (RA;US)
Water Removal
Dewatering of bean and powdered resin at Three Mile Island Unit 1, 11:29370 (RA;US)

RESISTANCE WELDING
Transformers
400 Hz welding transformer gun assembly evaluation. Final report, 11:30395 (R;US)

RESONANCE CAVITIES
See CAVITY RESONATORS

RESONANCE SCATTERING
Molecular Models
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
Time Dependence
Detailed aspects of Raman scattering. Overtone and combination intensities and prescriptions for determining excited-state structure, 11:30815 (J;US)
RESPIRABLE DUSTS
See DUSTS
RESPIRATION
Biological Pathways
Reduced apparent photorespiration by the C_3-C_4 intermediate species, Moricandia arvensis and Panicum milioides, 11:30633 (J;US)
RESPIRATORS
Research Programs
Respiratory Protection Program. Programmatic description, 11:30737 (R;US)
RESPIRATORY EQUIPMENT
See RESPIRATORS
RETINOIC ACID
Photochemical Reactions
[Mesityl]bacteriorhodopsin. The properties of an analogue of the purple membrane containing [mesityl]retinal as the chromophore, 11:30637 (J;GB)
RETORTED SHALES
See SPENT SHALES
RETORTING
See also IN-SITU RETORTING
Gaseous Wastes
Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort, 11:29281 (BA;US)
RETORTS
Air Pollution Control
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)
Computer-Aided Design
A new oil shale retort fluid beds exchanging solids but not gases, 11:29270 (BA;US)
Evaluation of blast designs for in situ oil shale retorting, 11:29262 (BA;US)
Design
Initial results of Green River Oil Shale Processing using the University of Utah's pilot scale bottom burning retort, 11:29269 (BA;US)
Results of mathematical modeling of oil shale retorting in an aboveground, external-combustion, moving-bed retort, 11:29268 (BA;US)
Heaters
Combustion heater for oil shale, 11:29265 (P;US)
Mathematical Models
Pressure loss in packed beds of low void fraction, 11:29267 (BA;US)
Results of mathematical modeling of oil shale retorting in an aboveground, external-combustion, moving-bed retort, 11:29268 (BA;US)
Performance Testing
Initial results of Green River Oil Shale Processing using the University of Utah's pilot scale bottom burning retort, 11:29269 (BA;US)
Permeability
A method for estimating permeability in oil shale retorts based on pressure and temperature measurements, 11:29266 (BA;US)
Uses
A new oil shale retort fluid beds exchanging solids but not gases, 11:29270 (BA;US)
REVERSE-FIELD PINCH
Plasma Confinement
Invited paper: confinement scaling, equilibrium, and stabilization studies in FRX-C, 11:31264 (BA;US)
Plasma Diagnostics
Thomson scattering measurements in the FRX-C device, 11:31263 (BA;US)
Plasma Simulation
Question of consistent boundary conditions when simulating reversed field pinch dynamics. Revision 1, 11:30986 (R;US)
Scaling Laws
Invited paper: confinement scaling, equilibrium, and stabilization studies in FRX-C, 11:31264 (BA;US)
Thomson Scattering
Thomson scattering measurements in the FRX-C device, 11:31263 (BA;US)
REVERTANTS
DNA Sequencing
Episomal DNA as a molecular probe of cytoplasmic male sterility in S Zea mays, 11:30650 (BA;US)
RF SYSTEMS
Cavity Resonators
Monochromatic radio frequency accelerating cavity, 11:30403 (P;US)
Materials Testing
Materials problems for highly irradiated ICRH Launchers in fusion reactors, 11:31195 (J;US)
Monochromatic Radiation
Monochromatic radio frequency accelerating cavity, 11:30403 (P;US)
RHENIUM
Electrochemistry
Manganese, technetium, and rhenium, 11:30221 (BA;US)
Thermodynamics
Manganese, technetium, and rhenium, 11:30221 (BA;US)
RHENIUM ALLOYS
Physical Radiation Effects
Radiation-induced segregation and precipitation in molybdenum-rhenium alloys, 11:30083 (R;US)
RHODANATES
See THIOCYANATES
RHODANIDES
See THIOCYANATES
RHODIUM OXIDES
Sorptive Properties
FT-IR study of nitric oxide chemisorbed on Rh/Al_2O_3, 11:30214 (J;US)
RHODOPSIN
Photochemical Reactions
[Mesityl]bacteriorhodopsin. The properties of an analogue of the purple membrane containing [mesityl]retinal as the chromophore, 11:30637 (J;GB)
RIBULOSE DIPHOSPHATE CARBOXYLASE
Biochemical Reaction Kinetics
Gas exchange characteristics of leaves as indicators of the basic limitations to the rate of photosynthesis. Second annual report, 1 June 1985-31 May 1986, 11:29503 (R;US)
Enzyme Activity
Gas exchange characteristics of leaves as indicators of the basic limitations to the rate of photosynthesis. Second annual report, 1 June 1985-31 May 1986, 11:29503 (R;US)
RICHLAND FFTF REACTOR
See FFTF REACTOR
RINGS (STORAGE)
See STORAGE RINGS
RISA
See ORGANIC IODINE COMPOUNDS
RISER CRACKING
See COAL LIQUEFACTION
RISK ANALYSIS
See RISK ASSESSMENT
RISK ASSESSMENT
Computerized Simulation
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
Data Base Management
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
Lectures
Science, technology, and society, 11:30735 (R;US)
Mathematical Models
Ecological risk analysis: prospects and problems, 11:30601 (RA;US)

Research Programs
Overview of Sandia's risk rebaselining/risk reduction analyses for NUREG-1150, 11:29862 (R;US)

RIVERS
See also COLUMBIA RIVER
Aeration
Costs of reservoir releases aeration, 11:29495 (R;US)

RIVETS
See FASTENERS

ROAD TRANSPORT
Computerized Simulation
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)

ROBOTS
Use of robotics for radioactive waste shipping and receiving, 11:29307 (R;US)
Design
Kinematic modelling and graphic simulation of path planning for mobile vehicles, 11:30351 (R;US)
Research Programs
Kinematic modelling and graphic simulation of path planning for mobile vehicles, 11:30351 (R;US)

ROCK SALT
See SALT DEPOSITS

ROCKET ENGINES
Combustion Kinetics
Numerical simulation method for combustion in an oxyhydrogen rocket motor, 11:30281 (RA;JP)

ROCK-FLUID INTERACTIONS
Research Programs
Brine injection studies, 11:29912 (RA;US)
INEL injection research: physical model studies, 11:29911 (RA;US)

ROCKS
See also IGNEOUS ROCKS
METAMORPHIC ROCKS
SEDIMENTARY ROCKS
Fracture Mechanics
Analysis of triaxial testing using a fracture damage model, 11:30386 (R;US)
Mechanical Tests
Analysis of triaxial testing using a fracture damage model, 11:30386 (R;US)

ROCKY FLATS PLANT
Radioactive Waste Processing
Waste Systems progress report, March 1984-February 1985, 11:29413 (R;US)

ROD BUNDLES
Fluid Flow
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume II. User's manual, 11:29801 (R;US)
Heat Transfer
COMMIX-1B: a three-dimensional transient single-phase computer program for thermal hydraulic analysis of single and multicomponent systems. Volume II. User's manual, 11:29801 (R;US)

ROD DROP ACCIDENTS
Computerized Simulation
Effects of rod worth and drop speed on the BWR off-center rod drop accident, 11:29825 (R;US)

RODS (FUEL)
See FUEL RODS

ROTATION
Measuring Instruments
Accurate measurement of small rotations by modulating polarization. Final report, 11:30500 (R;US)

ROTORS
See also DARRIEUS ROTORS
TIPVANE ROTORS
Aerodynamics
Aerodynamic performance of a new LM 17.2 m rotor, 11:29660 (RA;DE)
Performance
Aerodynamic performance of a new LM 17.2 m rotor, 11:29660 (RA;DE)
Velocity
Resonance compensation of wind power plants with variable rotor speed, 11:29668 (R;SE;In Swedish)

RUBIDIUM
Catalytic Effects
Computed tomography of coals. Quarterly technical progress report No. 8, July 1-September 30, 1984, 11:29156 (R;US)

RUBIDIUM 82
Dosimetry
Quantitative studies in radiopharmaceutical science. Progress report, January 1-December 31, 1985, 11:30663 (R;US)

RUBIDIUM FLUORIDES
Chemical Preparation
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Infrared Spectra
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)
Vibrational States
Complexes of cesium and rubidium fluorides with bromine trifluoride, 11:30226 (J;CH)

RUNOFF
Liquid Flow
Inflow to a crack in playa deposits of Yucca Lake, Nevada Test Site, Nye County, Nevada, 11:30745 (R;US)

RURAL AREAS
Land Use
Land use model with a constant-utility spatially variant wage, 11:30592 (J;US)

RUSSELLVILLE-1 ARKANSAS REACTOR
See ARKANSAS-1 REACTOR

RUTHENIUM
Catalytic Effects
Kinetics of CO oxidation over Ru(0001), 11:30201 (J;US)
Radiolysis
Radiation-induced reactions of polymer radicals with ruthenium tris(bipyridyl)-OH adducts in aqueous solutions, 11:30252 (J;US)

RUTHENIUM COMPLEXES
Cations
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Chemical Reaction Kinetics
Kinetics and mechanisms of electron transfer between blue copper proteins and electronically excited chromium and ruthenium polypyridine complexes, 11:30292 (J;US)
Electron Transfer
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Excited States
Pyridinium quenchers of $Ru(bpy)_3^{2+}$ charge effects of the yield of electron transfer, 11:30291 (J;US)
Luminescence
Pyridinium quenchers of $Ru(bpy)_3^{2+}$ charge effects of the yield of electron transfer, 11:30291 (J;US)
Photolysis
Laser flash photolytic determination of triplet yields via singlet oxygen generation, 11:30297 (J;CH)
Radicals
Bonded vs. nonbonded electron transfers in molten salts: characterization and rates of formation of the radical cations and dications of phenoxazine and phenothiazine and behavior of the M(2,2'-bipyridine)$_3$/sup 2+/3+/ (M = Fe, Ru, Os) complexes in $SbCl_3$-rich media, 11:30244 (J;US)
Structural Chemical Analysis
Anorganic chemistry, 11:30191 (RA;ZA;In Afrikaans)
Structure chemistry, 11:30192 (RA;ZA;In Afrikaans)

S

S CODES
Design
Design review of the SYVAC Executive, November 1984-February 1985, 11:29440 (R;GB)
SAFETY (REACTOR)
See REACTOR SAFETY
SAFETY STANDARDS
Indexes
Cross-index to DOE-prescribed occupational safety codes and standards, 11:30736 (R;US)
SALAMANDERS
Populations
Addendum to the distribution of two herptiles in Idaho, 11:30571 (J;US)
SALINE ZONE
See OIL SHALES
PICEANCE CREEK BASIN
SALT CAVERNS
Creep
Comparison between predicted and measured south drift closures at the WIPP using a transient creep model for salt, 11:30752 (R;US)
Three dimensional modeling of the wedge pillar portion of the WIPP Geomechanical Evaluation (Room G) in situ experiment, 11:30755 (R;US)
Deformation
Early results from the thermal/structural in situ test series at the WIPP, 11:30751 (R;US)
SALT DEPOSITS
Dissolution
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Geologic Structures
Evaluation of the structure and stratigraphy over Richton Dome, Mississippi, 11:30738 (R;US)
Hydraulic Conductivity
Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
Hydraulic Fracturing
Experience with hydraulic fracturing tests for stress measurements in the WIPP, 11:30753 (R;US)
Hydrology
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Permeability
Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
Rock Mechanics
Three dimensional modeling of the wedge pillar portion of the WIPP Geomechanical Evaluation (Room G) in situ experiment, 11:30755 (R;US)
Rock-Fluid Interactions
Saline dissolution collapse in the Piceance Creek Basin, 11:29259 (BA;US)
Stratigraphy
Evaluation of the structure and stratigraphy over Richton Dome, Mississippi, 11:30738 (R;US)
Stresses
Experience with hydraulic fracturing tests for stress measurements in the WIPP, 11:30753 (R;US)
SAMARIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Isotope Ratio
Removal of isobaric interferences by resonance ionization mass spectrometry, 11:30188 (J;US)
SAMARIUM SULFIDES
Physical Radiation Effects
Pressure and irradiation effects on transport properties of samarium compounds with instable valence, 11:30155 (R;FR;In French)
Pressure Dependence
Pressure and irradiation effects on transport properties of samarium compounds with instable valence, 11:30155 (R;FR;In French)
Valence
Pressure and irradiation effects on transport properties of samarium compounds with instable valence, 11:30155 (R;FR;In French)
SANDIA LABORATORIES
Research Programs
Magma energy and geothermal permeability enhancement programs, 11:29641 (RA;US)
Sandia geothermal technology program: interactions with other DOE research and CSDP, 11:29910 (RA;US)
SANDSTONES
Bulk Density
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Elasticity
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Hydraulic Fracturing
Quasi-static and dynamic arbitrary fracture propagation in jointed rock, 11:29252 (R;US)
Shear Properties
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Sonic Logging
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Wave Propagation
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
SAUDI ARABIA
Climates
Bioclimatic indicators for determining passive and low energy hybrid systems - case study, Saudi Arabia, 11:29585 (RA;US)
Energy conservation and its implication for architectural design and town planning in the hot-arid areas of Saudi Arabia and the US Gulf States, 11:29589 (RA;US)
Insolation
Solar radiation on different oriented vertical surfaces: Riyadh case study, 11:29498 (RA;US)
Residential Buildings
Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)
Weather
Climate of Riyadh and the passive response in traditional buildings, 11:30010 (RA;US)
SAVANNAH RIVER PLANT
Environmental Effects
Division of Wetlands Ecology FY-1985 highlights, 11:30569 (RA;US)
Research Programs
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Division of Wetlands Ecology FY-1985 highlights, 11:30569 (RA;US)
Division of Stress and Wildlife Ecology FY-1985 highlights, 11:30570 (RA;US)
SCANDIUM 46
Diffusion
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
SCANDIUM SULFIDES
Electronic Structure
Calculated electron density distributions in ScS and Sc_3S_4, 11:30205 (J;US)
SCANNING ELECTRON MICROSCOPY
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
SCANNING LIGHT MICROSCOPY
Reliability
Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics, 11:30122 (R;US)

SCATTERING
See also QUASI-ELASTIC SCATTERING
Diffraction Models
Diffractive hard scattering and the SSC, 11:30848 (R;US)
Jet Model
Diffractive hard scattering and the SSC, 11:30848 (R;US)
SCHOOL FACILITIES
See EDUCATIONAL FACILITIES
SCHOOL PLANT
See EDUCATIONAL FACILITIES
SCHOOLS
See EDUCATIONAL FACILITIES
SCINTILLATION CHAMBERS
See SCINTILLATION COUNTERS
SCINTILLATION COUNTERS
See also SCINTILLATOR-PHOTODIODE DETECTORS
SOLID SCINTILLATION DETECTORS
Materials Testing
A cerium glass fiber-optic active target for high energy physics experiments, 11:30474 (J;US)
Properties of new scintillation glasses and scintillating fibers, 11:30473 (J;US)
Optical Fibers
A cerium glass fiber-optic active target for high energy physics experiments, 11:30474 (J;US)
Properties of new scintillation glasses and scintillating fibers, 11:30473 (J;US)
Optical Properties
Properties of new scintillation glasses and scintillating fibers, 11:30473 (J;US)
Photomultipliers
Tetrode photomultiplier base for high magnetic field environments, 11:30458 (J;US)
Pulse Generators
Fast timing light pulser for scintillation detectors, 11:30489 (J;NL)
Timing Circuits
Fast timing light pulser for scintillation detectors, 11:30489 (J;NL)
SCINTILLATION DETECTORS
See SCINTILLATION COUNTERS
SCINTILLATOR-PHOTODIODE DETECTORS
Design
A scintillator-photodiode position detector, 11:30460 (J;US)
Performance
Highly segmented NaI(Tl) detector with vacuum photodiode readout for measuring electromagnetic showers at the CERN ISR, 11:30485 (J;NL)
Photodiodes
A scintillator-photodiode position detector, 11:30460 (J;US)
Readout Systems
A scintillator-photodiode position detector, 11:30460 (J;US)
SCOTLAND
See UNITED KINGDOM
SCREWS
See FASTENERS
SCRUBBERS
Design
Shale oil aerosol removal using a Venturi scrubber environmental research on WRI's ten-ton oil shale retort, 11:29281 (BA;US)
SEA BED
Sediments
Geotechnical properties of fine-grained turbidite sequences: observations from the Nares Abyssal Plain, 11:30750 (R;US)
SEA DISPOSAL
See MARINE DISPOSAL
SEALING MATERIALS
Materials Testing
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
Microwave Heating
Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
Thermal Diffusion
Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
SEALS
Fabrication
Ceramic-glass-metal seal by microwave heating, 11:30128 (P;US)
Ceramic-glass-ceramic seal by microwave heating, 11:30129 (P;US)
Shape memory alloy seals for geothermal applications, 11:29637 (R;US)
SEASONAL THERMAL ENERGY STORAGE
Research Programs
STES newsletter: a quarterly review of seasonal thermal energy storage, 11:29988 (J;US)
Simulation
STES newsletter: a quarterly review of seasonal thermal energy storage, 11:29988 (J;US)
SEAWATER
Corrosive Effects
Investigations of the vibrational corrosion of structural steels in seawater, 11:30095 (R;DE;In German)
SECONDARY BATTERIES
See ELECTRIC BATTERIES
SEDIMENTARY ROCKS
See also PHOSPHATE ROCKS
SANDSTONES
SHALES
Physical Properties
Studies of froosh, the thermoregulating indigenous construction material of the Saudi Arabian Gulf Coast, 11:29579 (RA;US)
Stresses
Elastic and viscoelastic model of the stress history of sedimentary rocks, 11:30754 (R;US)
SEDIMENTS
Physical Properties
Geotechnical properties of fine-grained turbidite sequences: observations from the Nares Abyssal Plain, 11:30750 (R;US)
SEEDLINGS
Biological Adaptation
Effects of quantum flux density of photosynthesis and chloroplast ultrastructure in tissue-cultured plantlets and seedlings of Liquidambar styraciflua L. towards improved acclimatization and field survival, 11:30679 (J;US)
Photosensitivity
Blue and green light-induced phototropism in Arabidopsis thaliana and Lactuca sativa L. seedlings, 11:30683 (J;US)
Plant Growth
Ethylene and the growth of rice seedlings, 11:30676 (J;US)
SEISMIC DETECTION
Data Processing
Discrimination of NTS explosions and western United States earthquakes: data processing, 11:30518 (R;US)
SELENIUM
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
SELENIUM COMPOUNDS
Detection
Detection of organomercury, selenium and arsenic compounds by a capillary column gas chromatography-microwave plasma detector system, 11:30224 (J;GB)
SELF-POWERED NEUTRON DETECTORS
Performance Testing
In-core measurements with platinum self powered detectors in a French PWR, 11:29756 (R;FR)
SEM (MICROSCOPY)
See SCANNING ELECTRON MICROSCOPY
SEMICIRCULAR SPECTROMETERS
See FLAT MAGNETIC SPECTROMETERS
SEMICONDUCTOR COUNTERS
See SEMICONDUCTOR DETECTORS
SEMICONDUCTOR DETECTORS
See also SI SEMICONDUCTOR DETECTORS

Design
A solid state directional gamma detector, 11:30433 (J;US)
Sensitivity
A solid state directional gamma detector, 11:30433 (J;US)
SEMICONDUCTOR DEVICES
See also CHARGE-COUPLED DEVICES
Fabrication
Method for production of free standing polycrystalline boron phosphide film, 11:30172 (P;US)
SEMICONDUCTOR MATERIALS
If possible index also the specific compounds.
Casting
Method and apparatus for casting conductive and semiconductive materials, 11:30170 (P;US)
SENIOR CENTERS
See PUBLIC BUILDINGS
SENSIBLE HEAT STORAGE
Feasibility Studies
Store heat underground, 11:29878 (J;US)
Materials
Inorganic compounds for passive solar energy storage. Solid-state dehydration materials and high specific heat materials. Progress report, 11:29612 (R;US)
SENSITIVITY ANALYSIS
G Codes
Automated sensitivity analysis using the GRESS language, 11:30741 (R;US)
O Codes
Version of ORIGEN2 with automated sensitivity-calculation capability, 11:29398 (R;US)
SEQUESTRENE
See EDTA
SERI
See SOLAR ENERGY RESEARCH INSTITUTE
SERVICE SECTOR
Energy Conservation
Electricity in the service sector of France, 11:29953 (RA;US)
Energy Consumption
Data collection in the service sector, 11:29964 (RA;US)
Disaggregating the service sector: survey results from Denmark, 11:29963 (RA;US)
Electricity consumption in the tertiary sector (The Netherlands), 11:29952 (RA;US)
Electricity in the service sector of France, 11:29953 (RA;US)
Electricity consumption in Belgium's service sector, 11:29956 (RA;US)
Electricity use in Taiwan's service sector, 11:29957 (RA;US)
Energy use in the service sector in Sweden, 11:29951 (RA;US)
Energy use in the service sector in the United Kingdom, 11:29954 (RA;US)
Forecast for energy consumption in the service sector, 11:29969 (RA;US)
Forecasting electricity use in the service sector, 11:29974 (RA;US)
Models of the US service sector, 11:29971 (RA;US)
New electricity-using technologies in Swedish buildings, 11:29975 (RA;US)
Service-sector electricity consumption in Denmark, 11:29949 (RA;US)
Trends of electricity consumption in the small consumers' sector of the Federal Republic of Germany, 11:29955 (RA;US)
Energy Models
Forecast for energy consumption in the service sector, 11:29969 (RA;US)
Models of the US service sector, 11:29971 (RA;US)
Power Demand
Data collection in the service sector, 11:29964 (RA;US)
Disaggregating the service sector: survey results from Denmark, 11:29963 (RA;US)
Electricity consumption in the tertiary sector (The Netherlands), 11:29952 (RA;US)
Electricity consumption in Belgium's service sector, 11:29956 (RA;US)
Electricity use in Taiwan's service sector, 11:29957 (RA;US)
Getting end-use load shape data for commercial buildings - the energy information project at Sierra Pacific Power Company, 11:29965 (RA;US)
Service-sector electricity consumption in Denmark, 11:29949 (RA;US)
Trends of electricity consumption in the small consumers' sector of the Federal Republic of Germany, 11:29955 (RA;US)
SEYFERT GALAXIES
Cosmic Ray Flux
Blazars, quasars and starbursts, 11:30800 (RA;GB)
Infrared Spectra
Infrared emission from active nuclei, 11:30799 (RA;GB)
Models for IRAS galaxies, 11:30803 (RA;GB)
On the origin of extragalactic infrared radiation, 11:30791 (RA;GB)
SHALE GAS
Chemical Composition
Laboratory studies of the kinetics at high temperature pyrolysis of shale. Final report, 11:29275 (R;SE;In Swedish)
SHALE MINING
See OIL SHALE MINING
SHALE OIL
See also SHALE OIL FRACTIONS
Pyrolysis
Pyrolysis of model alkyl pyridine compounds, 11:29274 (BA;US)
SHALE OIL FRACTIONS
Catalytic Reforming
Marketable transport fuels from Julia Creek shale oil, 11:29273 (BA;US)
Refining
Marketable transport fuels from Julia Creek shale oil, 11:29273 (BA;US)
SHALES
Bulk Density
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Elasticity
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Geology
Geology of the host formation for the new hydraulic fracturing facility at Oak Ridge National Laboratory, 11:29375 (RA;US)
Mineralogy
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
Shear Properties
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Sonic Logging
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
Wave Propagation
In-situ dynamic moduli of Mesaverde rocks compared to static and dynamic laboratory moduli, 11:29250 (R;US)
SHALLOW LAND BURIAL
See GROUND DISPOSAL
SHAPED CHARGES
Prior to August 1979 CHEMICAL EXPLOSIVES and SHAPE were used.
Detonations
High explosive modeling in 2D Euler code for shaped charge problems, 11:30511 (R;US)
SHARJA
See UNITED ARAB EMIRATES
SHEATHS (FUEL)
See FUEL CANS
SHEEP
Habitat
Ural-Tweed bighorn sheep - wildlife mitigation project. Annual report, 1 September 1984-31 December 1985, 11:30590 (R;US)
SHIELDING MATERIALS
Physical Radiation Effects
Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)

Radioactivation
Low activation burning core reactor design studies, 11:31241 (J;US)

SHIELDS
See also THERMAL SHIELDS
Cost Benefit Analysis
TFCX shielding optimization, 11:31149 (J;US)
Design
MFTF-α+T shield design, 11:31155 (J;US)
Shield design for next-generation, low-neutron-fluence, superconducting tokamaks, 11:31150 (J;US)
Materials Testing
Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)
Neutron Fluence
Shield design for next-generation, low-neutron-fluence, superconducting tokamaks, 11:31150 (J;US)
Optimization
TFCX shielding optimization, 11:31149 (J;US)

SHOCK (IMPACT)
See IMPACT SHOCK

SHORT-LENS SPECTROMETERS
See MAGNETIC LENS SPECTROMETERS

SHOTFIRING
See EXPLOSIVE FRACTURING

SHOWER COUNTERS
Detects high energy gamma radiation or high energy particles on basis of cascade showers in layered absorbers.
Data Acquisition Systems
MARK II end cap calorimeter electronics, 11:30470 (J;US)
Performance report for Stanford/SLAC Multi-Channel Sample-and-Hold Device, 11:30457 (J;US)
Energy Resolution
Design and performance of a CCD based readout for the DELPHI barrel electromagnetic calorimeter, 11:30467 (J;US)
Multi-Channel Analyzers
Performance report for Stanford/SLAC Multi-Channel Sample-and-Hold Device, 11:30457 (J;US)
NaI Detectors
Highly segmented NaI(Tl) detector with vacuum photodiode readout for measuring electromagnetic showers at the CERN ISR, 11:30485 (J;NL)
Performance
Performance of the SLD Warm Iron Calorimeter pre-prototype, 11:30477 (J;US)
Performance Testing
SLD liquid argon calorimeter prototype test results, 11:30455 (J;US)
Readout Systems
Design and performance of a CCD based readout for the DELPHI barrel electromagnetic calorimeter, 11:30467 (J;US)
Scintillator-Photodiode Detectors
A scintillator-photodiode position detector, 11:30460 (J;US)
Highly segmented NaI(Tl) detector with vacuum photodiode readout for measuring electromagnetic showers at the CERN ISR, 11:30485 (J;NL)

SHREDDERS
Operation
Operating experience of a mobile waste shredding system, 11:29347 (RA;US)

SI SEMICONDUCTOR DETECTORS
See also LI-DRIFTED SI DETECTORS
Construction
A silicon vertex detector for CDF, 11:30446 (J;US)
Design
A silicon vertex detector for CDF, 11:30446 (J;US)
Detection of charged particles in amorphous silicon layers, 11:30425 (R;US)
Fabrication
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)
Performance
Detection of charged particles in amorphous silicon layers, 11:30425 (R;US)
Performance Testing
Detection of charged particles in amorphous silicon layers, 11:30428 (J;US)
Testing
Silicon position sensitive detectors for the HELIOS (NA34) experiment, 11:30423 (R;US)

SIALON
See ALUMINIUM OXIDES
SILICON NITRIDES

SIEGBAHN SPECTROMETERS
See FLAT MAGNETIC SPECTROMETERS

SILENE REACTOR
Research Programs
Research program and uses of the solution fueled reactor SILENE, 11:29816 (R;FR;In French)
Uses
Research program and uses of the solution fueled reactor SILENE, 11:29816 (R;FR;In French)

SILICA
Mineralogy
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
Opacity
Transient absorption of light induced by radiation, 11:30160 (R;US)
Physical Radiation Effects
Transient absorption of light induced by radiation, 11:30160 (R;US)
Precipitation
Geothermal research at the Puna Facility. Technical report, 11:29642 (R;US)
Quantitative Chemical Analysis
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Surface Area
Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)

SILICA GEL
Chemical Reactions
Guest molecules in coal. Sixth quarterly report, January 1, 1986-March 31, 1986 (Semicarbazide bonded silica gel), 11:29182 (R;US)
Sorptive Properties
Silica gel sorption properties under adiabatic conditions, 11:29604 (R;US)

SILICEOUS ROCK
See SANDSTONES

SILICIC ACID ESTERS
See ORGANIC SILICON COMPOUNDS

SILICON
Annealing
Development of laser-processed high-efficiency n+pp+ silicon solar cells, 11:29557 (BA;US)
Crystal Growth
Flat-Plate Solar Array Project (FSA) progress and plans, 11:29558 (BA;US)
Deposition
Effect of argon and hydrogen on deposition of silicon from tetrachlorosilane in cold plasmas, 11:30123 (R;US)
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Grain Boundaries
Polycrystalline silicon: Impurity incorporation and passivation, 11:29556 (BA;US)
Ion Implantation
Development of laser-processed high-efficiency n+pp+ silicon solar cells, 11:29557 (BA;US)

Passivation
Polycrystalline silicon: Impurity incorporation and passivation, 11:29556 (BA;US)

SILICON ALLOYS
Formation Free Enthalpy
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
Lattice Parameters
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
Order Parameters
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)
Physical Radiation Effects
Radiation-induced segregation in light-ion bombarded Ni-8% Si, 11:30088 (R;US)
Stability
Stability of ordered bulk and epitaxial semiconductor alloys, 11:30169 (J;US)

SILICON CARBIDES
Chemical Vapor Deposition
Simultaneous chemical vapor deposition of SiC-dispersed phase composites, 11:30131 (BA;US)
Fabrication
Chemical vapor infiltration of fiber-reinforced ceramic composites, 11:30143 (R;US)
Development of a continuous spinning process for producing silicon carbide - silicon nitride precursor fibers. Final report, 11:30121 (R;US)
Fracture Properties
Silicon carbide whisker reinforced ceramic composites and method for making same, 11:30126 (P;US)
Simultaneous chemical vapor deposition of SiC-dispersed phase composites, 11:30131 (BA;US)
Hot Pressing
Silicon carbide whisker reinforced ceramic composites and method for making same, 11:30126 (P;US)
Scanning Light Microscopy
Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics, 11:30122 (R;US)
Voids
Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics, 11:30122 (R;US)

SILICON CHLORIDES
Decomposition
Effect of argon and hydrogen on deposition of silicon from tetrachlorosilane in cold plasmas, 11:30123 (R;US)

SILICON COMPOUNDS
See also SILANES, SILOXANES and SILICONES.
See also SILICON CARBIDES
SILICON CHLORIDES
SILICON FLUORIDES
SILICON NITRIDES
SILICON OXIDES
Crystal Structure
Nuclear magnetic resonance studies of amorphous silicon hydrides: proton spin dynamics, 11:30223 (D;US)

SILICON FLUORIDES
Chemical Reactions
Infrared multiphoton absorption and reaction of 2-chloro-1,1,1-trifluoroethane, 11:30264 (J;US)

SILICON NITRIDES
Fabrication
Development of a continuous spinning process for producing silicon carbide - silicon nitride precursor fibers. Final report, 11:30121 (R;US)
Scanning Light Microscopy
Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics, 11:30122 (R;US)
Voids
Reliability of scanning laser acoustic microscopy for detecting internal voids in structural ceramics, 11:30122 (R;US)

SILICON OXIDES
See also SILICA
Breeding Ratio
Thermochemical comparison of the effectiveness of protium purging of fusion breeders, 11:31142 (J;US)

SILICON SEMICONDUCTOR DETECTORS
See SI SEMICONDUCTOR DETECTORS

SILICON SOLAR CELLS
Annealing
Burst annealing of electron damage in silicon solar cells, 11:29529 (RA;US)
Computerized Simulation
High-efficiency silicon solar-cell design and practical barriers, 11:29504 (R;US)
Constraints
High-efficiency silicon solar-cell design and practical barriers, 11:29504 (R;US)
Design
High-efficiency silicon solar-cell design and practical barriers, 11:29504 (R;US)
Efficiency
GaAsP on GaP top solar cells, 11:29523 (RA;US)
Influence of design variables on radiation hardness of silicon MINP solar cells, 11:29531 (RA;US)
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)
Electric Potential
Further research on high open circuit voltage in silicon solar cells, 11:29518 (RA;US)
Fabrication
Development of laser-processed high-efficiency n+pp+ silicon solar cells, 11:29557 (BA;US)
Influence of design variables on radiation hardness of silicon MINP solar cells, 11:29531 (RA;US)
Photovoltaic concentrator research status, 11:29611 (BA;US)
Status of photovoltaics R & D at SERI, 11:29548 (BA;US)
Ion Implantation
Further research on high open circuit voltage in silicon solar cells, 11:29518 (RA;US)
Performance
Two years of on-orbit gallium arsenide performance from the LIPS solar cell panel experiment, 11:29537 (RA;US)
Performance Testing
Mechanically-stacked multijunction solar cells, 11:29555 (BA;US)
Physical Radiation Effects
Burst annealing of electron damage in silicon solar cells, 11:29529 (RA;US)
I-V-T analysis of radiation damage in high efficiency Si solar cells, 11:29530 (RA;US)
Radiation damage in high-resistivity silicon solar cells, 11:29532 (RA;US)
Space Environment Workshop, 11:29544 (RA;US)
Radiation Hardening
Influence of design variables on radiation hardness of silicon MINP solar cells, 11:29531 (RA;US)
Reflectivity
Optical effects of thin film adhesives in multijunction solar cells, 11:29549 (BA;US)
Research Programs
Cell research and technology workshop, 11:29543 (RA;US)
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)

SILOXANES
Additives
Method for controlling the viscosity of siloxane oils, 11:29249 (P;US)
Viscosity
Method for controlling the viscosity of siloxane oils, 11:29249 (P;US)

SILVER
Auger Electron Spectroscopy
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Bonding
Method of bonding silver to glass and mirrors produced according to this method, 11:29610 (P;US)
Catalytic Effects
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)

Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Electron Diffraction
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Energy Beam Deposition
Method of bonding silver to glass and mirrors produced according to this method, 11:29610 (P;US)
Photoelectron Spectroscopy
Cs-promoted Ag(111): model studies of selective ethylene oxidation catalysts, 11:30213 (J;US)
Surface Properties
Surface-enhanced resonance Raman study of the photoreduction of methylviologen on a p-InP semiconductor electrode, 11:30285 (J;US)
Surfaces
Radiative decay of surface plasmons on nonspherical silver particles, 11:30115 (BA;US)
Vacuum Coating
Method of bonding silver to glass and mirrors produced according to this method, 11:29610 (P;US)

SILVER 110
Diffusion
Silver-tracer diffusion in Cu_2O, 11:30230 (J;GB)

SILVER ISOTOPES
See also SILVER 110
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Neon 20 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Oxygen 16 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)

SIMS
See MASS SPECTROSCOPY

SIN CYCLOTRON
Includes the 590 MeV ring cyclotron and the two injector cyclotrons.
Materials Testing
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys (Candidate window materials for SIN beam stop), 11:30099 (R;US)
Windows
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys (Candidate window materials for SIN beam stop), 11:30099 (R;US)

SINGAPORE
Building Codes
Analysis of energy conservation standards for Singapore office buildings, 11:30020 (J;GB)
Office Buildings
Analysis of energy conservation standards for Singapore office buildings, 11:29978 (RA;US)

SINGLE CRYSTALS
See MONOCRYSTALS

SISTER CHROMATID EXCHANGES
Biological Indicators
Use of cytogenetic endpoints in human lymphocytes as indicators of exposure to genotoxicants, 11:30721 (BA;US)

SKELETON
Congenital Malformations
Axial skeleton malformations induced by 5 fluoro-2'-desoxycytidine (FCdR) and X-rays in mice of the breeding strains C57Bl/6JHanFfm, C57Bl/10JFfm, and in hamsters of the GHFfm breeding strain. A comparative evaluation considering gestation stages and dose-response-relationships, 11:30692 (R;DE;In German)

SKYRMIONS
See SOLITONS

SLABS
Thicker than PLATES, primarily for use in shielding studies.
Design
Global methods for reinforced concrete slabs, 11:30151 (R;FR)

SLATIS-SIEGBAHN SPECTROMETERS
See MAGNETIC LENS SPECTROMETERS

SLC
See STANFORD LINEAR COLLIDER

SLC DETECTORS
Cherenkov Counters
Development of the Cerenkov Ring Imaging Detector for the SLD, 11:30449 (J;US)
Data Acquisition Systems
Overview of the data acquisition electronics system design for the SLAC linear collider detector (SLD), 11:30443 (J;US)
Design
Overview of the SLD, 11:30442 (J;US)
Drift Chambers
Analysis of digitized waveforms in a prototype of the SLD central drift chamber, 11:30452 (J;US)
Performance of the SLD Central Drift Chamber prototype, 11:30476 (J;US)
Waveform sampler CAMAC module, 11:30444 (J;US)
Fastbus System
The FASTBUS Segment Extension as a crate coupling concept, 11:30463 (J;US)
Shower Counters
Performance of the SLD Warm Iron Calorimeter pre-prototype, 11:30477 (J;US)
SLD liquid argon calorimeter prototype test results, 11:30455 (J;US)

SLD
See SLC DETECTORS

SLIP FLOW
Corrections
Slip correction measurements for aerosol particles of doublet and triangular triplet aggregates of spheres, 11:30821 (RA;US)

SLM
See SCANNING LIGHT MICROSCOPY

SLOT OVENS
See COKE OVENS

SLOW NEUTRONS
T Invariance
Tests of T-invariance with slow neutrons, 11:30947 (R;US)

SLUDGES
Chemical Composition
Analytical characterization of West Valley high-level waste sludge, 11:29396 (RA;US)
Fluidized-Bed Combustion
Possibilities of using sludge for energy purposes, 11:30027 (R;FI;In Finnish)
Materials Handling
Status of the waste removal system for the West Valley Demonstration Project, 11:29397 (RA;US)
Waste Processing
Possibilities of using sludge for energy purposes, 11:30027 (R;FI;In Finnish)

SLUGS (FUEL)
See FUEL RODS

SLURRIES
See also FUEL SLURRIES
Slurry growth: the characterization of a unique phenomenon at the Hanford Site, 11:29394 (RA;US)

SLURRIES (FUEL)
See FUEL SLURRIES

SMALL BUSINESSES
Contracts
General design of a technical assistance program to help DOE/prime contractor buyers in doing business with small disadvantaged businesses, 11:31272 (R;US)

SMECTITE
Hydrothermal Alteration
Effect of pH on the stability of smectite, 11:30148 (R;CA)

SMOKES
Environmental Impacts
Progress in developing the smoke source term for "nuclear winter" studies: major uncertainties, 11:30545 (R;US)

SNAKES
Populations
Addendum to the distribution of two herptiles in Idaho, 11:30571 (J;US)
SNG
See HIGH BTU GAS
SODA ASH
See SODIUM CARBONATES
SODIUM
Adsorption
Quantitative mineralogy and preliminary pore-water chemistry of candidate buffer and backfill materials for a nuclear fuel waste disposal vault, 11:29313 (R;CA)
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Separation Processes
Eluent and ligand effects in cation chromatography, 11:30185 (D;US)
SODIUM 22
Diffusion
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
SODIUM CARBONATES
Production
Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation, 11:29277 (BA;US)
SODIUM CHLORIDES
Biological Effects
Proteins associated with adaptation of cultured tobacco cells to NaCl, 11:30644 (J;US)
Convection
Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
Diffusion
Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
Thermodynamic Properties
Large-scale fluctuations and the critical behavior of dilute NaCl in H_2O, 11:30197 (J;US)
SODIUM CITRATES
See SODIUM COMPOUNDS
SODIUM COMPLEXES
Comparative Evaluations
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
SODIUM COMPOUNDS
See also SODIUM CARBONATES
SODIUM CHLORIDES
SODIUM FLUORIDES
SODIUM OXIDES
SODIUM SILICATES
SODIUM SULFATES
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
SODIUM FLUORIDES
Neon 20 Reactions
Coplanarity of two-proton emissions in 400 MeV/nucleon Ne + NaF, Pb reactions, 11:30906 (R;JP)
SODIUM IODIDE DETECTORS
See NAI DETECTORS
SODIUM LAURYL SULFATES
See SODIUM COMPOUNDS
SODIUM MINERALS
See MINERALS
SODIUM OXIDES
Aerosols
Local transport of vertically- and horizontally-emitted sodium oxide aerosols, 11:29778 (R;US)
SODIUM SILICATES
Compression Strength
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
Microstructure
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
Stability
Alternative sealing materials for radioactive waste longterm storage or disposal, 11:30153 (RA;US)
SODIUM SULFATES
Phase Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
SODIUM-SULFUR BATTERIES
Electrodes
Post-test analyses of Na/S cells and aqueous batteries, 11:29898 (RA;US)
Performance Testing
Accelerated life testing of sodium-sulfur cells, 11:30054 (RA;US)
Advanced secondary battery development and testing: a Canadian perspective, 11:29880 (RA;US)
In-test and post-test analyses of sodium-sulfur cells, 11:29899 (RA;US)
Overview of battery testing in the UK, 11:29882 (RA;US)
Overview of rechargeable battery testing in Japan, 11:29883 (RA;US)
Start-up test for NaS-traction-batteries, 11:29889 (RA;US)
Use of computer network to achieve testing flexibility, 11:29896 (RA;US)
Solid Electrolytes
Solid electrolyte for high energy density batteries, 11:29902 (R;US)
Temperature Control
Design of the thermal management systems for NaS-traction-batteries by using battery models, 11:30056 (RA;US)
SOILS
Compacting
Subsidence and settlement and their effect on shallow land burial, 11:29326 (RA;US)
Contamination
Use of the food-chain model FOOD III and the soil model SCEMR to assess irrigation as a biosphere pathway, 11:30579 (R;CA)
Deformation
Subsidence and settlement and their effect on shallow land burial, 11:29326 (RA;US)
Natural Radioactivity
Aerial radiological survey of the Feed Materials Production Center and surrounding area, Fernald, Ohio. Date of survey: April 1985, 11:30583 (R;US)
Radionuclide Migration
Application of organic tracers in characterizing the Greater Confinement Disposal Test at the Nevada Test Site, 11:29340 (RA;US)
Behavior of ^{137}Cs-tagged particles in a fescue meadow, 11:30701 (BA;XA)
Iodine in terrestrial wildlife on the US Department of Energy's Handford site in south-central Washington, 11:30585 (J;NL)
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Response Modifying Factors
Factors influencing pool fires on porous ground, 11:30544 (R;GB)
Sampling
Aerial radiological survey of the Feed Materials Production Center and surrounding area, Fernald, Ohio. Date of survey: April 1985, 11:30583 (R;US)
SOLAR BATTERIES
See SOLAR CELL ARRAYS
SOLAR CELL ARRAYS
Computer-Aided Design
Computer analysis tool for evaluation of solar array design, 11:29512 (RA;FR)

Computerized Simulation
Computer analysis tool for evaluation of solar array design, 11:29512 (RA;FR)
Photovoltaic array simulation, 11:29511 (RA;FR)
Configuration
Interplanetary exploration-A challenge for photovoltaics, 11:29456 (RA;US)
Cost
Array technology and applications, 11:29545 (RA;US)
Interplanetary exploration-A challenge for photovoltaics, 11:29456 (RA;US)
Design
Block V module development and test results, 11:29554 (BA;US)
Design, performance investigation and delivery of a miniaturized Cassegrainian concentrator solar array. Final technical report, 11:29515 (R;US)
High efficiency flat-plate module research, 11:29551 (BA;US)
PASP: a high voltage array experiment, 11:29538 (RA;US)
Fabrication
Flat-Plate Solar Array Project (FSA) progress and plans, 11:29558 (BA;US)
High efficiency flat-plate module research, 11:29551 (BA;US)
Forecasting
Future Air Force space power needs, 11:29560 (RA;US)
Meetings
Space photovoltaic research and technology 1985: high efficiency, space environment, and array technology, 11:29516 (R;US)
Mission Analysis
Array technology and applications, 11:29545 (RA;US)
Performance
MARECS and ECS: the first few years in orbit, 11:29507 (RA;FR)
Two years of on-orbit gallium arsenide performance from the LIPS solar cell panel experiment, 11:29537 (RA;US)
Performance Testing
Block V module development and test results, 11:29554 (BA;US)
Flat-Plate Solar Array Project (FSA) progress and plans, 11:29558 (BA;US)
Soldered Joints
Demonstrated results of welded and soldered interconnections, 11:29541 (RA;US)
Technology Assessment
Array technology and applications, 11:29545 (RA;US)
Thermal Cycling
Demonstrated results of welded and soldered interconnections, 11:29541 (RA;US)
Welded Joints
Demonstrated results of welded and soldered interconnections, 11:29541 (RA;US)

SOLAR CELLS
See also ALUMINIUM ARSENIDE SOLAR CELLS
CADMIUM SULFIDE SOLAR CELLS
CADMIUM TELLURIDE SOLAR CELLS
CONCENTRATOR SOLAR CELLS
COPPER SELENIDE SOLAR CELLS
GALLIUM ARSENIDE SOLAR CELLS
GALLIUM PHOSPHIDE SOLAR CELLS
INDIUM SELENIDE SOLAR CELLS
SILICON SOLAR CELLS
Chemical Vapor Deposition
Vacuum MOCVD fabrication of high efficience cells, 11:29524 (RA;US)
Crystal Doping
Superlattices and multilayer structures for high efficiency solar cells, 11:29526 (RA;US)
Efficiency
Cell efficiency and module cost goals to achieve economic photovoltaic central power systems in the United States, 11:29563 (BA;US)
Superlattices and multilayer structures for high efficiency solar cells, 11:29526 (RA;US)
Vacuum MOCVD fabrication of high efficience cells, 11:29524 (RA;US)
Electric Contacts
Ink jet printing of silver metallization for photovoltaics. Quarterly technical report, January 1-March 31, 1986, 11:29505 (R;US)
Protective Coatings
Thin film coatings for improved alpha/epi, 11:29542 (RA;US)
Radiosensitivity
Superlattices and multilayer structures for high efficiency solar cells, 11:29526 (RA;US)
Superlattices
Superlattices and multilayer structures for high efficiency solar cells, 11:29526 (RA;US)

SOLAR COLLECTORS
See also FLAT PLATE COLLECTORS
Efficiency
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)
Research Programs
Overview of SERI's high efficiency solar cell research, 11:29517 (RA;US)

SOLAR COOKERS
Performance
Cookers for solar homes, 11:29591 (RA;US)

SOLAR COOLING SYSTEMS
See also PASSIVE SOLAR COOLING SYSTEMS
Absorption Refrigeration Cycle
Advanced absorption solar air-conditioning systems: thermal modeling and design aspects, 11:29597 (RA;US)
Thermodynamic properties state equations of pure methanol and methanol-LiBr . $ZnBr_2$ solutions used in vapor absorption refrigeration and air-conditioning cycle, 11:29595 (RA;US)
Control Equipment
Initial test results and test plan for differential temperature controllers used in solar energy systems, 11:29600 (R;US)
Dehumidifiers
Heat and mass transfer analysis of dehumidifiers using adiabatic transient tests, 11:29603 (R;US)
Design
Evaluation of SOLERAS solar cooling applications: a building case study and findings, 11:29593 (RA;US)
Simulation and optimization of design parameters of solar-operated absorption cooling machine, 11:29572 (RA;US)
Simulation of a two-stage solar-operated absorption cooling system, 11:29588 (RA;US)
Solar-powered, fuel-assisted Rankine cycle and cooling system: King Abdulaziz University cooling project, 11:29567 (RA;US)
UPM solar cooling project, 11:29577 (RA;US)
Economic Analysis
Performance and economic assessment of state-of-the-art solar cooling systems, 11:29573 (RA;US)
Feasibility Studies
Influence of orientation on the internal thermal environment of residential buildings in Riyadh, 11:29578 (RA;US)
Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)
Optimization
Simulation and optimization of design parameters of solar-operated absorption cooling machine, 11:29572 (RA;US)
Performance
Evaluation of SOLERAS solar cooling applications: a building case study and findings, 11:29593 (RA;US)
Performance and economic assessment of state-of-the-art solar cooling systems, 11:29573 (RA;US)
Simulation of a two-stage solar-operated absorption cooling system, 11:29588 (RA;US)
Solar-powered, fuel-assisted Rankine cycle and cooling system: King Abdulaziz University cooling project, 11:29567 (RA;US)
Solar-powered dual cycle absorption cooling system, 11:29576 (RA;US)
Solar thermoelectric cooling system, 11:29570 (RA;US)

Performance Testing
UPM solar cooling project, 11:29577 (RA;US)
Planning
Solar energy policies and the role of human settlements planner, 11:29583 (RA;US)
Program Management
Solar Heat Technologies international program coordination support. Final report, 11:29565 (R;US)
Public Policy
Solar energy policies and the role of human settlements planner, 11:29583 (RA;US)
Seasonal Thermal Energy Storage
Daily thermal storage for heating and cooling of buildings, 11:29590 (RA;US)
Technology Assessment
Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)

SOLAR DOMESTIC WATER HEATING
See SOLAR WATER HEATING

SOLAR ENERGY
Commercialization
Summary report on International Solar Commercialization/International Market Development Program, 11:29496 (R;US)
Market
Summary report on International Solar Commercialization/International Market Development Program, 11:29496 (R;US)

SOLAR ENERGY RESEARCH INSTITUTE
Research Programs
Status of photovoltaics R & D at SERI, 11:29548 (BA;US)

SOLAR FLARES
Emission Spectra
Excitation of the iron Kα feature in solar flares, 11:30788 (R;GB)
Heavy Ions
Heavy ion compositional signature in ^{3}He-rich solar particle events, 11:30786 (R;US)
Mass Transfer
X-ray signature of solar coronal mass ejections, 11:30789 (R;GB)
X-Ray Spectra
X-ray signature of solar coronal mass ejections, 11:30789 (R;GB)

SOLAR HEATING SYSTEMS
See also PASSIVE SOLAR HEATING SYSTEMS
Control Equipment
Initial test results and test plan for differential temperature controllers used in solar energy systems, 11:29600 (R;US)
Cost
Performance and cost experience of active solar-heated buildings, 11:29571 (RA;US)
Feasibility Studies
Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)
Flat Plate Collectors
Solar collectors for building applications, 11:29587 (RA;US)
Performance
Jordan's first solar-heated house, 11:29599 (RA;US)
Performance and cost experience of active solar-heated buildings, 11:29571 (RA;US)
Planning
Solar energy policies and the role of human settlements planner, 11:29583 (RA;US)
Program Management
Solar Heat Technologies international program coordination support. Final report, 11:29565 (R;US)
Public Policy
Solar energy policies and the role of human settlements planner, 11:29583 (RA;US)
Research Programs
Overview of US solar building research, 11:29575 (RA;US)
Seasonal Thermal Energy Storage
Daily thermal storage for heating and cooling of buildings, 11:29590 (RA;US)
Technology Assessment
Solarvilla - innovative concept of habitat using solar photovoltaic technology in energy self-sufficient housing for remote settlements throughout Saudi Arabia, 11:29514 (RA;US)

SOLAR PROCESS HEAT
Cost Estimation
Value of solar thermal industrial process heat, 11:29601 (R;US)

SOLAR RADIATION
Monitoring
Portable monitor for solar radiation that accumulates irradiance histograms for 32 leaf-mounted sensors, 11:30505 (J;NL)

SOLAR REFLECTORS
Fabrication
Method of bonding silver to glass and mirrors produced according to this method, 11:29610 (P;US)

SOLAR SPACE HEATING
Appraisal
Active solar heating in the UK. Department of Energy R and D programme 1977-1984, 11:29566 (R;GB)

SOLAR WATER HEATERS
Cost
Solar water heating - recent trends, cost, and performance, 11:29592 (RA;US)
Fluid Flow
Flow in the circulation loop of a thermosyphon solar water heating system, 11:29569 (RA;US)
Performance
Solar water heating - recent trends, cost, and performance, 11:29592 (RA;US)
Research Programs
Overview of US solar building research, 11:29575 (RA;US)

SOLAR WATER HEATING
Use for solar domestic water heating; not for process hot water.
Appraisal
Active solar heating in the UK. Department of Energy R and D programme 1977-1984, 11:29566 (R;GB)

SOLAR X-RAY BURSTS
Emission Spectra
Excitation of the iron Kα feature in solar flares, 11:30788 (R;GB)

SOLID ELECTROLYTES
Corrosion
Solid electrolyte for high energy density batteries, 11:29902 (R;US)

SOLID SCINTILLATION DETECTORS
See also BGO DETECTORS
NAI DETECTORS
PLASTIC SCINTILLATION DETECTORS
Data Acquisition Systems
A real time data compactor (sparsifier) and 8 megabyte high speed FIFO for HEP, 11:30469 (J;US)
Physical Radiation Effects
Radiation damage test of barium fluoride scintillator, 11:30495 (J;NL)

SOLID WASTES
See also WOOD WASTES
Minimization
Solid waste minimization at Duke Power Company, 11:29366 (RA;US)

SOLIDS
Charge Exchange
Charge and spin density waves in charge-transfer solids, 11:30269 (J;GB)
Defects
Defects in solids studied by optical techniques, 11:30158 (RA;ZA)
Studies of defects with the Moessbauer effect, 11:30157 (RA;ZA)
Electronic Structure
Charge and spin density waves in charge-transfer solids, 11:30269 (J;GB)

SOLIDS FLOW
Reviews
Fundamentals of bulk solids flow (369 references), 11:29211 (R;GB)
SOLID-STATE PLASMA
ICR Heating
Selective heating and separation of isotopes in a metallic plasma, 11:31012 (BA;US)
SOLITONS
Particle Models
Skyrmions, 11:30956 (R;FR)
SOLVENT EXTRACTION
Computerized Simulation
Consolidated Fuel Reprocessing Program. Progress report, October 1-December 31, 1985, 11:29296 (R;US)
SOLVENT-REFINED COAL
Gas Chromatography
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Leaching
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Liquid Column Chromatography
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Quantitative Chemical Analysis
Chromatographic chemical characterization of solvent refined coal I and II, 11:30725 (J;DE)
Toxicity
Chromatographic chemical characterization of solvent refined coal I and II, 11:30725 (J;DE)
SOLVENT-REFINING COAL PLANTS
See COAL PREPARATION PLANTS
SONIC LOGGING
Corrections
Computer method to detect and correct cycle skipping on sonic logs (NNWSI project), 11:30746 (R;US)
SOOT
Molecular Structure
Reactivity of large carbon clusters: spheroidal carbon shells and their possible relevance to the formation and morphology of soot, 11:30248 (J;US)
SORA REACTOR
Power Supplies
Probabilistic analysis of the events: loss of electric power supply of the secondary coolant circuit pump related to the busbar AL1 AL2 and loss of power supply of the busbar ML1 ML2 of the primary coolant circuit of the SORA reactor, 11:29819 (R;FR;In Italian)
SOUTH AFRICA
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
SOUTH AMERICA
See also BRAZIL
COLOMBIA
URUGUAY
VENEZUELA
Mineral Cycling
Organic carbon-14 in the Amazon River system, 11:30605 (J;US)
SOUTH DAKOTA
Granites
Thermally induced chemical migration: a natural analog approach. [Technical progress report], 11:30759 (R;US)
SOUTH KOREA
See REPUBLIC OF KOREA
SOUTH TEXAS PROJECT-1 REACTOR
Bay City, Texas, USA
Reactor Licensing
Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499) , 11:29847 (R;US)
Reactor Operation
Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499) , 11:29847 (R;US)
Reactor Safety
Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499) , 11:29847 (R;US)
SOUTH TEXAS PROJECT-2 REACTOR
Bay City, Texas, USA
Reactor Licensing
Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499) , 11:29847 (R;US)
Reactor Operation
Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499) , 11:29847 (R;US)
Reactor Safety
Safety Evaluation Report related to the operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499) , 11:29847 (R;US)
SOUTHWEST REGION
See FEDERAL REGION VI
SOVIET UNION
See USSR
SPACE FLIGHT
Mission Analysis
Interplanetary exploration-A challenge for photovoltaics, 11:29456 (RA;US)
SPACE HEATING
See also SOLAR SPACE HEATING
Fuels
Analyzing the applicability of black coal in public buildings of the Ruhr District, 11:30012 (R;DE;In German)
SPACE LATTICES
See CRYSTAL LATTICES
SPACE POWER REACTORS
See also SPACE PROPULSION REACTORS
Coated Fuel Particles
High flux research reactors based on particulate fuel, 11:29784 (R;US)
High power density reactors based on direct cooled particle beds, 11:29783 (R;US)
Reactor Cores
High power density reactors based on direct cooled particle beds, 11:29783 (R;US)
SPACE PROPULSION REACTORS
Coated Fuel Particles
High flux research reactors based on particulate fuel, 11:29784 (R;US)
Forecasting
Future Air Force space power needs, 11:29560 (RA;US)
Fuel Elements
Particle bed reactor propulsion vehicle performance and characteristics as an orbital transfer rocket, 11:29824 (R;US)
SPACECRAFT POWER SUPPLIES
Computer-Aided Design
MATPWR: a mission analysis tool for LEO spacecraft power profiles computation, 11:30397 (RA;FR)
Computerized Simulation
Spacecraft orbital power evaluation (SCOPE), 11:30396 (RA;FR)
Cost
Interplanetary exploration-A challenge for photovoltaics, 11:29456 (RA;US)
Design
Telecom 1 power subsystem from design to flight, 11:29508 (RA;FR)
Energy Balance
Spacecraft orbital power evaluation (SCOPE), 11:30396 (RA;FR)
Energy Consumption
MATPWR: a mission analysis tool for LEO spacecraft power profiles computation, 11:30397 (RA;FR)
Forecasting
Future Air Force space power needs, 11:29560 (RA;US)

Mass
Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Meetings
Proceedings of ESA sessions at the 16th IEEE annual power electronics specialists conference, 11:29506 (R;FR)
Space photovoltaic research and technology 1985: high efficiency, space environment, and array technology, 11:29516 (R;US)
Mission Analysis
MATPWR: a mission analysis tool for LEO spacecraft power profiles computation, 11:30397 (RA;FR)
Nuclear Power Plants
Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Performance
MARECS and ECS: the first few years in orbit, 11:29507 (RA;FR)
Physical Radiation Effects
Space Environment Workshop, 11:29544 (RA;US)
Power Demand
Power requirements for commercial communications spacecraft, 11:29561 (RA;US)
Reliability
Reliability and mass analysis of dynamic power conversion systems with parallel of standby redundancy, 11:29785 (R;US)
Specifications
ERS-1 power system, 11:29510 (RA;FR)
Giotto power supply subsystem, 11:29509 (RA;FR)

SPARK IGNITION ENGINES
Methanol Fuels
Research and development of alcohol fuel useage in spark-ignited engines, 11:30069 (R;US)

SPECTROPHOTOMETERS
Fiber Optics
Fiber optic modification of a diode array spectrophotometer, 11:30496 (R;US)

SPEED INDICATORS
See VELOCIMETERS

SPENT FUEL CASKS
Heat Transfer
BWR spent fuel storage cask performance test. Volume 1. Cask handling experience and decay heat, heat transfer, and shielding data, 11:29303 (R;US)
Materials Handling
Radiological analysis for dry cask storage of spent fuels, 11:29443 (RA;US)
Performance Testing
BWR spent fuel storage cask performance test. Volume 1. Cask handling experience and decay heat, heat transfer, and shielding data, 11:29303 (R;US)
Rail Transport
Assessment of spent nuclear fuel shipping cask handling capabilities of commercial light water reactors, 11:29304 (R;US)
Road Transport
Assessment of spent nuclear fuel shipping cask handling capabilities of commercial light water reactors, 11:29304 (R;US)
Shielding
BWR spent fuel storage cask performance test. Volume 1. Cask handling experience and decay heat, heat transfer, and shielding data, 11:29303 (R;US)

SPENT FUEL ELEMENTS
Dissolution
Fuel characterization research for the Canadian Nuclear Fuel Waste Management Program, 11:29315 (R;CA)
Leaching
Fuel characterization research for the Canadian Nuclear Fuel Waste Management Program, 11:29315 (R;CA)

SPENT FUEL STORAGE
See also DRY STORAGE
MONITORED RETRIEVABLE STORAGE
Survey and assessment of radioactive waste management facilities in the United States. Section 2.5. Air-cooled vault storage facilities, 11:29299 (R;US)

SPENT FUELS
Information Systems
Data processing in the integrated data base for spent fuel and radioactive waste, 11:29421 (BA;US)
Inventories
Data processing in the integrated data base for spent fuel and radioactive waste, 11:29421 (BA;US)
Monitored Retrievable Storage
Staff evaluation of US Department of Energy proposal for monitored retrievable storage, 11:29300 (R;US)
Radioactive Waste Disposal
Spent Fuel Test-Climax mineby revisited, 11:29418 (R;US)

SPENT LIQUORS
Evaporation
Vapour recompression evaporation of black liqour, 11:30026 (R;FI;In Finnish)
Physical Properties
Physical properties of spent liquor from chemical pulping processes, 11:30028 (R;FI;In Finnish)

SPENT SHALES
Chemical Composition
An evaluation of the effects of weathering on a 50-year old retorted oil-shale waste pile, Rulison Experimental Retort, Colorado, 11:29287 (BA;US)
Combustion
Nitric oxide (NO) emissions from combustion of retorted oil shale, 11:29282 (BA;US)
Demetallization
Assessing potential trace metal leachability of retorted oil shale by complexometric agents, 11:29286 (BA;US)
Environmental Impacts
Hydrogeologic characterization of the Colony Shale Oil Project Area, 11:29256 (BA;US)
Hydraulic Conductivity
Liquid and vapor transport coefficients for retorted oil shale, 11:29284 (BA;US)
Leaching
Assessing potential trace metal leachability of retorted oil shale by complexometric agents, 11:29286 (BA;US)
Reduction-grade alumina and soda ash from Dawsonitic oil shale Section 1. Chemistry and process investigation, 11:29277 (BA;US)
Moisture
Liquid and vapor transport coefficients for retorted oil shale, 11:29284 (BA;US)
Retorting
Combustion heater for oil shale, 11:29265 (P;US)
Sorptive Properties
The effect of residual carbon on adsorption of organic compounds by retorted oil shale, 11:29285 (BA;US)
Waste Disposal
Liquid and vapor transport coefficients for retorted oil shale, 11:29284 (BA;US)
The effect of residual carbon on adsorption of organic compounds by retorted oil shale, 11:29285 (BA;US)
Weathering
An evaluation of the effects of weathering on a 50-year old retorted oil-shale waste pile, Rulison Experimental Retort, Colorado, 11:29287 (BA;US)

SPINELS
Chemical Radiation Effects
Effects of alpha irradiation on barium hollandite and nickel-iron spinel, 11:30306 (J;US)

SPIRAL ORBIT SPECTROMETERS
See FLAT MAGNETIC SPECTROMETERS

SPOIL BANKS
Acid Mine Drainage
Factors and treatment of abandoned acid mine lands for controlling nonpoint source pollution, 11:29192 (RA;US)
Classification
Factors and treatment of abandoned acid mine lands for controlling nonpoint source pollution, 11:29192 (RA;US)

Pollution Control
Factors and treatment of abandoned acid mine lands for controlling nonpoint source pollution, 11:29192 (RA;US)

SPR-3 REACTOR
Reactor Maintenance
Remote maintenance robot system for a pulsed nuclear reactor, 11:29822 (R;US)
Sensor-driven, fault-tolerant control of a maintenance robot, 11:29823 (R;US)
Robots
Remote maintenance robot system for a pulsed nuclear reactor, 11:29822 (R;US)
Sensor-driven, fault-tolerant control of a maintenance robot, 11:29823 (R;US)

SPRAY PONDS
See SPRAYS

SPRAYS
Design
Machine for applying a two component resin to a roadway surface, 11:30022 (P;US)

STAINLESS STEEL-304
Cavitation
Mechanics and mechanisms of intergranular cavitation in creeping alloys, 11:30118 (BA;NL)
Crack Propagation
Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments, 11:29754 (J;US)
Heat Transfer
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
Materials Testing
Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments, 11:29754 (J;US)
Stress Corrosion
Stress corrosion crack growth rates in Type 304 stainless steel in simulated BWR environments, 11:29754 (J;US)

STAINLESS STEEL-304L
Dynamic Loads
Technique for megabar controlled strain experiments, 11:30098 (R;US)
Shock Waves
Technique for megabar controlled strain experiments, 11:30098 (R;US)

STAINLESS STEEL-310
Mechanical Properties
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

STAINLESS STEEL-316
Corrosion
Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium, 11:31037 (RA;US)
Corrosion of type 316 stainless steel and 12 Cr-1 MoVW steel in flowing Pb-17 at. % Li, 11:31038 (RA;US)
Environmental effects on properties of structural alloys in flowing lithium, 11:31039 (RA;US)
Creep
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Mechanical Properties
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Neutronic Damage Functions
Neutronics calculations in support of the ORR-MFE-4A and -4B spectral tailoring experiments, 11:31043 (RA;US)
Physical Radiation Effects
Effect of cold work on tensile behavior of irradiated type 316 stainless steel, 11:30086 (R;US)
Miniature tensile test specimens for fusion reactor irradiation studies, 11:31049 (RA;US)
Operation of the ORR spectral tailoring experiments (ORR-MFE-4A and ORB-MFE-4B), 11:31044 (RA;US)
Stress Corrosion
Stress corrosion cracking of PCA - initial considerations and characterization of grain boundary precipitation, 11:31042 (RA;US)

STAINLESS STEEL-316L
Corrosion
Study of metallic materials behavior in low oxygen activity atmospheres (Corrosion of alloy 800 H and steel 316L for coal gasification structural materials), 11:30077 (R;FR;In French)
Heat Transfer
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
Welded Joints
Study of crack inititation and propagation in heterogeneous welded joints, 11:30074 (R;FR;In French)

STAINLESS STEELS
STAINLESS STEEL-304
See also STAINLESS STEEL-304L
STAINLESS STEEL-310
STAINLESS STEEL-316
STAINLESS STEEL-316L
Chemical Composition
Development of austenitic steel for fast induced-radioactivity decay, 11:31053 (RA;US)
Chemical Reactions
Compatibility of Li_2O in a flowing helium environment, 11:31040 (RA;US)
Collisions
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
Fracture Properties
Insights into the fracture toughness of martensitic stainless steels using stereoscopic fractographic measurements, 11:30096 (R;US)
Irradiation Procedures
US/Japan collaborative testing program in HFIR and ORR: specimen matrices for HFIR irradiation, 11:31050 (RA;US)
Materials Testing
FY 1984 and FY 1985 geochemistry and materials studies in support of the Magma Energy Extraction Program, 11:29639 (R;US)
Metallurgical Effects
Swelling behavior of titanium-modified alloys in EBR-II, 11:31054 (RA;US)
Microstructure
Development of austenitic steel for fast induced-radioactivity decay, 11:31053 (RA;US)
Influence of titanium on the tempering structure of austenitic steels, 11:30078 (R;FR;In French)
Physical Radiation Effects
Assessment of helium effects on swelling by reirradiation in FFTF of Path A alloys previously irradiated in HFIR, 11:31048 (RA;US)
Irradiation experiments for the US/Japan collaborative testing program in HFIR and ORR, 11:31052 (RA;US)
Reirradiation in FFTF of swelling-resistant Path A alloys previously irradiated in HFIR, 11:31047 (RA;US)
Swelling behavior of titanium-modified alloys in EBR-II, 11:31054 (RA;US)
Swelling of Fe-Cr-Mn ternary alloys in FFTF, 11:31055 (RA;US)
Test matrices for irradiation of Path A Prime Candidate and developmental alloys in FFTF, 11:31046 (RA;US)
Poisson Ratio
Poisson's ratio measurements for martensitic stainless steels, 11:31065 (RA;US)

STANDARDS
See also SAFETY STANDARDS
Evaluated Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Experimental Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Theoretical Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)

STANDING CROP
See BIOMASS

STANFORD LINEAR COLLIDER
Beam Dynamics
Centrifugal space-charge forces in SLC, 11:30414 (R;US)
Data Acquisition Systems
MARK II end cap calorimeter electronics, 11:30470 (J;US)
Drift Chambers
dE/dx electronics for MARK II experiment at SLAC, 11:30445 (J;US)
STARCH
Biosynthesis
Alterations in growth, photosynthesis, and respiration in a starchless mutant of Arabidopsis thaliana (L.) deficient in chloroplast phosphoglucomutase activity, 11:30627 (J;US)
STATE BUILDINGS
See PUBLIC BUILDINGS
STATISTICAL MECHANICS
Ising Model
Canonical ensemble redefined - 2: Magnetic systems, 11:30957 (R;XA)
STATISTICAL MODELS
Comparative Evaluations
Assessing the significance of a spatial correlogram, 11:31292 (J;US)
STATISTICS
Limited to the indexing of information on the mathematical discipline of statistics or its application in other scientific disciplines; for indexing numerical values of a statistical nature use STATISTICAL DATA.
See also MULTIVARIATE ANALYSIS
Assessing the significance of a spatial correlogram, 11:31292 (J;US)
STEADY-STATE FUSION REACTORS
Design
Steady-state spheromak reactor studies, 11:31179 (J;US)
Feasibility Studies
Steady-state spheromak reactor studies, 11:31179 (J;US)
Spheromak Devices
Steady-state spheromak reactor studies, 11:31179 (J;US)
STEAM GENERATORS
Repair
Steam generator replacement, 11:29772 (R;FR)
Testing
Ten years of sodium cooled steam generator tests on the C.G.V.S. Synthesis of the results obtained on these equipments and operation experiments of an industrial size test facility, 11:29780 (R;FR;In French)
Tubes
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
STEAM LINES
Expansion Joints
Rolling cuff flexible bellows, 11:29248 (P;US)
STEAM TURBINES
Service Life
Effects of pulsed operation on the lifetime of turbine rotors, 11:31253 (J;US)
Stress Analysis
Effects of pulsed operation on the lifetime of turbine rotors, 11:31253 (J;US)
Temperature Effects
Effects of pulsed operation on the lifetime of turbine rotors, 11:31253 (J;US)
STEARIC ACID
See OCTADECANOIC ACID
STEEL INDUSTRY
See METAL INDUSTRY
STEEL-ASTM-A302
Fracture Properties
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Physical Radiation Effects
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
STEEL-ASTM-A533-B
Fracture Properties
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Physical Radiation Effects
Exploratory studies of element interactions and composition dependencies in radiation sensitivity development, 11:30103 (R;US)
Welded Joints
Study of crack inititation and propagation in heterogeneous welded joints, 11:30074 (R;FR;In French)
STEELS
See also AUSTENITIC STEELS
CARBON STEELS
CHROMIUM STEELS
FERRITIC STEELS
MARAGING STEELS
NICKEL STEELS
STAINLESS STEELS
STEEL-ASTM-A302
Blast Effects
Simple blast model for structural design, 11:30513 (R;US)
Corrosion
Corrosion studies on HLW steel containers, 11:29316 (R;FR)
Investigations of the vibrational corrosion of structural steels in seawater, 11:30095 (R;DE;In German)
Corrosion Resistance
Corrosion behaviour of container materials for geological disposal of high level radioactive waste, 11:30092 (R;FR)
Crack Propagation
Investigations of the vibrational corrosion of structural steels in seawater, 11:30095 (R;DE;In German)
Decontamination
Auburn Steel Company radioactive contamination incident, 11:29408 (R;US)
Stress Analysis
Diffraction moire of dynamic events, 11:30383 (R;US)
STEROIDS
Structural Chemical Analysis
Structure chemistry, 11:30192 (RA;ZA;In Afrikaans)
STES
See SEASONAL THERMAL ENERGY STORAGE
STIMULATED EMISSION DEVICES
See LASERS
STIRLING ENGINES
Coatings
Composition optimization of self-lubricating chromium carbide-based composite coatings for use to 760°C, 11:30091 (R;US)
Efficiency
Stirling machines: adiabatic to isothermal, 11:30048 (R;US)
Performance
Experimental assessment of advanced Stirling component concepts, 11:30049 (R;US)
STOCKPILES
Configuration
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
Density
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
Ground Subsidence
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
Measuring Methods
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
STOCKS
See INVENTORIES
STOMATA
Physiology
Guard cell biochemistry: response to environmental stimuli causing changes in gas exchange, 11:29501 (R;US)
Stomatal limitation to carbon gain in Paphiopedilum sp. (Orchidaceae) and its reversal by blue light, 11:30680 (J;US)
Stomatal responses to CO_2 in Paphiopedilum and Phragmipedium: role of the guard cell chloroplast, 11:30681 (J;US)

STORAGE BATTERIES
See ELECTRIC BATTERIES
STORAGE BATTERIES (LEAD-ACID)
See LEAD-ACID BATTERIES
STORAGE FACILITIES
Design
Survey and assessment of radioactive waste management facilities in the United States. Section 2.5. Air-cooled vault storage facilities, 11:29299 (R;US)
STORAGE RINGS
See also DORIS STORAGE RING
LEP STORAGE RINGS
TRISTAN STORAGE RINGS
Depolarization
Depolarization effects in a ring equipped with snakes, 11:30421 (R;FR)
Kicker Magnets
Spin-transparent vertical beam kicker, 11:30420 (R;FR)
STORAGE (SPENT FUEL)
See SPENT FUEL STORAGE
STORES
See COMMERCIAL BUILDINGS
STOVER
See AGRICULTURAL WASTES
STRAIN GAGES
Installation
Methods for verifying strain gage installations, 11:30345 (R;US)
STRAINS
Computerized Simulation
Foundations of statistical crack mechanics, 11:30958 (R;US)
STRATEGIC DEFENSE INITIATIVE
See BALLISTIC MISSILE DEFENSE
STRATEGIC PETROLEUM RESERVE
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
STRATOSPHERE
Organic Chlorine Compounds
Present state of knowledge of the upper atmosphere: an assessment report, 11:30540 (R;US)
Organic Fluorine Compounds
Present state of knowledge of the upper atmosphere: an assessment report, 11:30540 (R;US)
Ozone
Present state of knowledge of the upper atmosphere: an assessment report, 11:30540 (R;US)
STREAMS
See also RIVERS
Floods
Floods on North Toe River and Beaver, Grassy, and East Fork Grassy Creeks in the vicinity of Spruce Pine, North Carolina, 11:30743 (R;US)
Inventories
Biological and physical inventory of the streams within the Nez Perce Reservation. Synopsis of three years of stream inventory on the Nez Perce Reservation. Final report 1985, 11:30621 (R;US)
Radionuclide Migration
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Water Quality
Division of Wetlands Ecology FY-1985 highlights, 11:30569 (RA;US)
STRESS ANALYSIS
Interferometry
Diffraction moire of dynamic events, 11:30383 (R;US)
STRESS (BIOLOGICAL)
See BIOLOGICAL STRESS
STRESS CORROSION
Grain boundary segregation and environmentally-induced fracture of materials, 11:30105 (R;US)
STRETFORD PROCESS
Processing in situ oil shale retort offgas with a Stretford plant at Geokinetics, 11:29280 (BA;US)
STRING MODELS
Treating the interactions of extended particles through breaking and connection of strings.
Dimensions
Critical dimensions for strings in a curved background, 11:30881 (R;IT)
Lectures
String primer, 11:30887 (R;US)
Preons
Do superstrings lead to quarks or to preons, 11:30861 (R;XA)
Quarks
Do superstrings lead to quarks or to preons, 11:30861 (R;XA)
STRIPED BASS
Temperature Effects
Temperature selection by juvenile striped bass in laboratory and field, 11:30702 (J;US)
STRONTIUM
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Ion Exchange
Vitrokele compositions: novel, high affinity, metal selective and regenerable media for the removal of radioactive metals from aqueous nuclear waste streams, 11:29357 (RA;US)
Multi-Photon Processes
Studies of autoionizing states relevant to dielectronic recombination. Progress report, July 1, 1985-June 30, 1986, 11:30812 (R;US)
STRONTIUM 90
Leaching
Organic geochemical studies at a commercial shallow-land disposal site of low-level nuclear waste, 11:29422 (BA;US)
Uptake
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)
Uptake of waste Sr 90 and Cs 137 by soil and vegetation, 11:30589 (J;US)
STRONTIUM CHLORIDES
Convection
Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
Diffusion
Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
STRUCTURAL MATERIALS
See BUILDING MATERIALS
STRUCTURE (CRYSTAL)
See CRYSTAL STRUCTURE
STRUCTURES (BUILDINGS)
See BUILDINGS
STRUCTURES (MECHANICS)
See MECHANICAL STRUCTURES
STUDS
See FASTENERS
STYRENE POLYMERS
See POLYSTYRENE
SUBBITUMINOUS COAL
Ash Content
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
Sulfur Content
Carbon dioxide for fine coal flotation. Second and third quarterly report, December 1985-May 1986, 11:29207 (R;US)
SUBURBS
See URBAN AREAS
SULFATES
See also COBALT SULFATES
POTASSIUM SULFATES
SODIUM SULFATES
Comparative Evaluations
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate

micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Ecological Concentration
Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
Cross-sectional analysis of sulfate concentrations in the surface waters of New York and New England, 11:30608 (R;US)
Molecular Structure
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
Surface Properties
Electron spin echo modulation of doxylstearic acid probes of the surface and internal structure of lithium dodecyl sulfate micelles: comparison with sodium dodecyl sulfate and tetramethylammonium dodecyl sulfate micelles, 11:30242 (J;US)
SULFIDES
See also CARBON SULFIDES
HYDROGEN SULFIDES
IRON SULFIDES
SAMARIUM SULFIDES
SCANDIUM SULFIDES
Chemical Preparation
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS_5. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)
Chemical Properties
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS_5. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)
Crystal Structure
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS_5. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)
Molecular Structure
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS_5. A unique example of the twist-boat conformation of the MS_6 ring, 11:30319 (J;US)
SULFITE WASTE LIQUOR
See SPENT LIQUORS
SULFOCYANIDES
See THIOCYANATES
SULFONIC ACIDS
Catalytic Effects
Methoxybenzo[a]pyrene 4,5-oxides labeled with carbon-13: electronic effects in the NIH shift, 11:30259 (J;US)
SULFUR
Combustion Kinetics
Kinetics of nitrogen and sulfur reactions in combustion systems. Quarterly report No. 3, 11:29187 (R;US)
Deposition
Cross-sectional analysis of sulfate concentrations in the surface waters of New York and New England, 11:30608 (R;US)
Estimates of long-term trends in sulfur deposition, 11:30525 (R;US)
Diffusion
Sulfur diffusion in oxide grain boundaries, 11:30117 (J;GB)
Environmental Transport
Estimates of long-term trends in sulfur deposition, 11:30525 (R;US)
Inventories
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Liquid Column Chromatography
Separation and characterization of coal derived components, 1 January 1986-31 March 1986, 11:29175 (R;US)
Production
[Great Plains Coal Gasification Associates]. Quarterly technical progress report, 11:29155 (R;US)
Thermochemical Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
SULFUR CARBIDES
See CARBON SULFIDES
SULFUR DIOXIDE
Air Pollution
Forecasting future industrial SO_2 and NO/sub x/ emissions, 11:30551 (J;US)
Air Pollution Abatement
Atmospheric FBC and CFB: the European approach, 11:29222 (R;SE)
Coal cleaning as an acid rain mitigation strategy: an in-depth examination, 11:29214 (J;US)
Air Pollution Control
Evaluation of an air curtain secondary hooding system, 11:30531 (RA;US)
Impact of proposed acid rain legislation on power plant particulate control equipment, 11:29692 (RA;US)
Biological Effects
Forecasting effects of SO_2 pollution on growth and succession in a western conifer forest, 11:30728 (J;US)
Control
Kinetics of nitrogen and sulfur reactions in combustion systems. Quarterly report No. 3, 11:29187 (R;US)
Ecological Concentration
Atmospheric gas and particle measurements at a rural northeastern US site, 11:30546 (J;GB)
Relative humidity: important modifier of pollutant uptake by plants, 11:30555 (J;US)
Emission
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
Foliar Uptake
Relative humidity: important modifier of pollutant uptake by plants, 11:30555 (J;US)
Removal
Acid rain control options - impact on precipitator performance, 11:29734 (RA;US)
Comparison of dry injection systems at normal and high flue gas temperatures, 11:29195 (RA;US)
Design and operation of the baghouse at Holcomb Station, Unit No. 1, 11:29732 (RA;US)
Fabric filter operation downstream of a spray dryer: pilot and full-scale results, 11:29729 (RA;US)
Flue gas desulphurization and NO/sub x/ reduction, 11:29196 (R;SE)
Modeling of SO_2 removal in spray-dryer flue-gas desulfurization system, 11:29193 (RA;US)
Removal of sulfur dioxide and particulate using E-SOX, 11:29733 (RA;US)
Spray dryer/baghouse experiences on a 1000 ACFM pilot plant, 11:29731 (RA;US)
Start-up and operating experience with a reverse air fabric filter as part of the University of Minnesota dry FGD system, 11:29194 (RA;US)
Resonance Fluorescence
Method of using a nuclear magnetic resonance spectroscopy standard, 11:30549 (P;US)
SULFUR FLUORIDES
Dissociation
Vibrational predissociation of SF_6 clusters in a supersonic molecular beam, 11:30290 (J;US)
Electron-Molecule Collisions
S-wave threshold in electron attachment - observations and cross sections in CCl4 and SF6 at ultralow electron energies, 11:30818 (J;US)
Photolysis
Vibrational predissociation of SF_6 clusters in a supersonic molecular beam, 11:30290 (J;US)
SULFUR HYDRIDES
See HYDROGEN SULFIDES
SULFUR OXIDES
See also SULFUR DIOXIDE
SULFUR TRIOXIDE

Environmental Transport
Assessing environmental effects of oil-fuelled energy systems, 11:30527 (R;IT)

SULFUR SULFIDES
See SULFUR

SULFUR TRIOXIDE
Adsorption
Field study of a combined NH_3-SO_3 conditioning system on a cold-side fly ash precipitator at a coal-fired power plant, 11:29701 (RA;US)
Cleaning
Estimating the benefits of SO_3 gas conditioning on the performance of utility precipitators when burning US coals, 11:29690 (RA;US)

SULFURIC ACID
Chemical Reactions
Gas evolution oscillators. 6. Quantitative characterization of an experimental system, 11:30262 (J;US)
Decomposition
High-pressure catalytic metal reactor in a simulated solar central receiver, 11:29513 (R;US)
Removal
Analysis of air heater - fly ash - sulfuric acid vapor interactions, 11:29723 (RA;US)

SUPERALLOYS
See HEAT RESISTING ALLOYS

SUPERCONDUCTING CABLES
Design
Multistrand superconductor cable, 11:30358 (P;US)
Fabrication
Multistrand superconductor cable, 11:30358 (P;US)

SUPERCONDUCTING COILS
Design
Transitional behavior of pulsed dc losses in superconducting solenoids with self-fields greater than B*, 11:30355 (J;US)
Energy Losses
Transitional behavior of pulsed dc losses in superconducting solenoids with self-fields greater than B*, 11:30355 (J;US)

SUPERCONDUCTING MAGNETS
Current Limiters
Multivariable current control for electrically and magnetically coupled superconducting magnets, 11:31187 (J;US)
Design
Design of aggressive superconducting TFCX magnet systems, 11:31169 (J;US)
Octopole design concepts for the mirror end cell, 11:31184 (J;US)
Electric Currents
Multivariable current control for electrically and magnetically coupled superconducting magnets, 11:31187 (J;US)
Performance
Partial-array test results in IFSMTF, 11:31171 (J;US)
Performance Testing
Experience with operation of a large magnet system in the international fusion superconducting magnet test facility, 11:31170 (J;US)
Power Supplies
Multivariable current control for electrically and magnetically coupled superconducting magnets, 11:31187 (J;US)
Transition Temperature
Contribution to the study of superconducting magnets, 11:30339 (R;FR;In French)

SUPERCONDUCTING WIRES
Critical Current
Relationship between critical current and microstructure of internal tin wire, 11:30342 (R;US)

SUPERCONDUCTIVITY
Cooper Pairs
Theory of elementary excitations in intermediate valence materials, 11:30954 (BA;US)

SUPERCONDUCTORS
Impurities
Magnetic impurities in superconductors. Performance report, July 1, 1985-June 30, 1986, 11:30337 (R;US)

SUPERCRITICAL FLUID CHROMATOGRAPHY
Temperature Dependence
Temperature dependence of retention in supercritical fluid chromatography, 11:30182 (J;US)

SUPERCRITICAL GAS EXTRACTION
Research Programs
Thermodynamic properties for supercritical coal conversion. Quarterly progress report, January 1-March 31, 1986, 11:29161 (R;US)

SUPERGRAVITY
Conformal Invariance
Superconformal invariance and the tensor multiplet in six dimensions, 11:30882 (R;IT)
Many-Dimensional Calculations
Stable compactifications, 11:30880 (R;US)
Particle Multiplets
Superconformal invariance and the tensor multiplet in six dimensions, 11:30882 (R;IT)

SUPERLATTICES
Dislocations
Dislocation reduction in epitaxial GaAs on Si (100), 11:30165 (J;US)

SUPERSONIC FLOW
Algorithms
Investigation of chemically-reacting supersonic internal flows. Progress report, 11:30034 (R;US)
Computer Codes
Investigation of chemically-reacting supersonic internal flows. Progress report, 11:30034 (R;US)

SUPERSYMMETRY
Electron-Positron Interactions
New particle searches at e^+e machines, 11:30838 (R;FR)

SUPERVOLTAGE RADIOTHERAPY
See RADIOTHERAPY

SURFACE AIR
Air Pollution Monitoring
Ozone measurements near the ground and in the atmosphere in the first half-year 1985, 11:30541 (R;DE;In German and English)

SURFACE AREA
Measuring Methods
Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)

SURFACE MINING
Acid Mine Drainage
Acid mine drainage: surface mine treatment and in-situ abatement technology, 11:29189 (RA;US)
Environmental Impacts
Uncertainties in predicting fugitive dust emissions and concentrations around western surface coal mines, 11:29201 (J;US)
Land Reclamation
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
Trends in post-mining land uses - are we doing our children justice?, 11:29190 (RA;US)

SURFACE TREATMENTS
Research Programs
Chemistry research resource. Progress report, March 1986, 11:30175 (R;US)

SURFACE WATERS
See also LAKES
STREAMS
Acidification
Cross-sectional analysis of sulfate concentrations in the surface waters of New York and New England (ASTRAP), 11:30608 (R;US)
Chemical Composition
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
Water Quality
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)

SURFACE-ACTIVE AGENTS
See SURFACTANTS

SURFACES
Form Factors
Computer model for evaluation of form factors and interreflected radiant exchange for irregular geometrics with partial obstruction, 11:29499 (RA;US)
SURFACTANTS
Improvement of CO_2 flood performance. Annual report, April 1, 1984-September 30, 1985, 11:29234 (R;US)
Improvement of CO_2 flood performance. Annual report, 11:29236 (R;US)
SUSPENSIONS (FUEL)
See FUEL SLURRIES
SWEDEN
Commercial Sector
Utility perspective on commercial sector markets, 11:29970 (RA;US)
Energy Conservation
Stockholm project. Quality control of energy-efficient settlement, 11:29992 (R;SE;In Swedish)
Public Utilities
Utility perspective on commercial sector markets, 11:29970 (RA;US)
Service Sector
Energy use in the service sector in Sweden, 11:29951 (RA;US)
New electricity-using technologies in Swedish buildings, 11:29975 (RA;US)
SWISS INSTITUTE NUCLEAR RESEARCH CYCLOTRO
See SIN CYCLOTRON
SWITZERLAND
Energy Policy
Switzerland - energy situation 1984, 11:29935 (R;DE;In German)
Energy Supplies
Switzerland - energy situation 1984, 11:29935 (R;DE;In German)
Forests
Swiss forest damage inventory of 1984, 11:30714 (RA;DE;In German)
SYMPOSIA
See MEETINGS
SYNCHROTRON RADIATION SOURCES
Microwave Radiation
Microwave undulator, 11:30415 (R;US)
SYNTHETIC FUELS
See also ALCOHOL FUELS
Chemical Preparation
Marketable transport fuels from Julia Creek shale oil, 11:29273 (BA;US)
SYNTHETIC FUELS INDUSTRY
Labor Relations
The Mancamp Issue: Toward a good neighbor policy for major energy/minerals developments, 11:29942 (BA;US)
Minority Groups
Development of new business opportunities for minorities in the synthetic fuels program. Executive summary. Final report, August 11, 1980-June 27, 1981, 11:29941 (R;US)
Personnel Management
The Mancamp Issue: Toward a good neighbor policy for major energy/minerals developments, 11:29942 (BA;US)
Small Businesses
Development of new business opportunities for minorities in the synthetic fuels program. Executive summary. Final report, August 11, 1980-June 27, 1981, 11:29941 (R;US)
SYNTHETIC NATURAL GAS
See HIGH BTU GAS
SYSTEMS ANALYSIS
Used in the fields of technology research and management for problems such as the calculation of failure probabilities and for reliability studies of systems and components.
Computerized Simulation
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)
Data Base Management
System Analysis and Risk Assessment (SARA) system, 11:29834 (R;US)

T

T INVARIANCE
Symmetry Breaking
Tests of T-invariance with slow neutrons, 11:30947 (R;US)
TAIWAN
Commercial Sector
Commercial sector energy consumption in Taiwan, R.O.C., 11:29958 (RA;US)
Imports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Service Sector
Electricity use in Taiwan's service sector, 11:29957 (RA;US)
TANDEM MIRROR DEVICES
See TMR REACTORS
TMX DEVICES
TANDEM MIRROR TYPE REACTORS
See TMR REACTORS
TANDEM MIRRORS
Prior to September 1983 this concept was indexed to TMX DEVICES.
See also TMX DEVICES
ICR Heating
ICRF wave propagation and absorption in axisymmetric mirrors. Annual report, July 1, 1985-February 28, 1986, 11:30964 (R;US)
Magnet Coils
Magnetic ripple correction in tandem mirrors by ferromagnetic inserts, 11:31182 (J;US)
Magnetic Field Ripples
Magnetic ripple correction in tandem mirrors by ferromagnetic inserts, 11:31182 (J;US)
TANK FARMS
See STORAGE FACILITIES
TANTALATES
Specific compounds should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
TANTALUM
Physical Radiation Effects
Mechanical properties testing of several 800 MeV proton irradiated BCC metals and alloys (Candidate window materials for SIN beam stop), 11:30099 (R;US)
TANTALUM 178
Radiation Doses
Development of tungsten-tantalum generator. Final report, 11:30310 (R;US)
Radioisotope Generators
Development of tungsten-tantalum generator. Final report, 11:30310 (R;US)
TANTALUM ALLOYS
See also INCONEL 625
Stability
Thermal aging effects in refractory metal alloys, 11:29786 (R;US)
TARGETS
See also ALUMINIUM 27 TARGET
ALUMINIUM 28 TARGET
BERYLLIUM 9 TARGET
CALCIUM 40 TARGET
CARBON 12 TARGET
CARBON 14 TARGET
DEUTERIUM TARGET
GERMANIUM 76 TARGET
HELIUM 3 TARGET
HELIUM 4 TARGET
HYDROGEN 1 TARGET
ION BEAM TARGETS
IRON 54 TARGET
IRON 56 TARGET
IRON 57 TARGET
LITHIUM 6 TARGET
LITHIUM 7 TARGET

MAGNESIUM 26 TARGET
MOLYBDENUM 92 TARGET
POLARIZED TARGETS
TERBIUM 159 TARGET
TIN 112 TARGET
URANIUM 238 TARGET
YTTRIUM 89 TARGET
ZINC 64 TARGET
ZINC 66 TARGET
ZINC 68 TARGET

Fabrication
Method for production of ceramic oxide and carbide bodies by polymer inclusion and decomposition, 11:30419 (P;US)

TAXES
Income Distribution
Local taxation and the consequences of revenue distribution patterns, 11:30622 (J;NL)

TECHNETIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Electrochemistry
Manganese, technetium, and rhenium, 11:30221 (BA;US)
Thermodynamics
Manganese, technetium, and rhenium, 11:30221 (BA;US)

TECHNETIUM 99
Uptake
Lysimeter study of vegetative uptake from saltstone. Part I. Design, installation, and data collection plan, 11:30582 (R;US)

TELEVISION
Interference
Measurements of TV-interference from the wind power plant at Maglarp, 11:29644 (R;SE;In Swedish)

TELLURIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Fission Products
Tellurium behavior in containment under light water reactor accident conditions, 11:29856 (R;US)

TEMPERATURE CONTROL
Initial test results and test plan for differential temperature controllers used in solar energy systems, 11:29600 (R;US)

TEMPERATURE (ION)
See ION TEMPERATURE

TENDONS (STRUCTURAL)
See CABLES

TENNESSEE VALLEY REGION
Agriculture
Distribution maps - national fertilizer programs; agricultural programs in the seven Tennessee Valley states; Tennessee Valley region: major land uses, livestock inventories, farm products, 11:30689 (R;US)

TERBIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)

TERBIUM 158
K Capture
Electron capture decay of ^{158}Tb, 11:30915 (R;AU)
L Capture
Electron capture decay of ^{158}Tb, 11:30915 (R;AU)

TERBIUM 159 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)

TERPHENYLS
Chemical Reaction Kinetics
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Emission Spectroscopy
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Radiolysis
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)

TERRESTRIAL BACKGROUND
See BACKGROUND RADIATION

TERRESTRIAL ECOSYSTEMS
Biogeochemistry
Division of Biogeochemical Ecology FY-1985 highlights, 11:30760 (RA;US)
Distribution
Climatic change and the broad-scale distribution of terrestrial ecosystem complexes, 11:30572 (J;NL)

TEST FACILITIES
See also FELIX FACILITY
TRITIUM SYSTEMS TEST ASSEMBLY
Comparison of TRAC-PF1/MOD1 to a no-failure UPI test in the Cylindrical Core Test Facility, 11:29844 (R;US)
Binary-Fluid Systems
Supercritical binary geothermal cycle experiments with mixed-hydrocarbon working fluids and a vertical, in-tube, counterflow condenser, 11:29629 (R;US)
Computerized Control Systems
Battery data for use in expert systems, 11:29892 (RA;US)
Data acquisition and control instrumentation of the BEWAG battery test facility, 11:29894 (RA;US)
Design, electric vehicle simulation program and duty cycle for a computer controlled bench test of lead-acid batteries, 11:30057 (RA;US)
Data Acquisition Systems
Data acquisition and control instrumentation of the BEWAG battery test facility, 11:29894 (RA;US)
Test and data reduction algorithm for the evaluation of lead-acid battery packs, 11:30052 (RA;US)
Design
A module for testing a lithium cooled tokamak blanket in a tandem mirror test reactor, 11:31152 (J;US)
An impurity control test facility (ICTF) for the study of fusion reactor/plasma edge materials, 11:31161 (J;US)
Experimental facility for studying MHD effects in liquid metal cooled blankets, 11:31110 (J;US)
Performance
An impurity control test facility (ICTF) for the study of fusion reactor/plasma edge materials, 11:31161 (J;US)
Experimental facility for studying MHD effects in liquid metal cooled blankets, 11:31110 (J;US)
Test requirements for solid breeder blanket thermal behavior, 11:31134 (J;US)
Specifications
Operating and geometrical arrangement requirements for fusion neutronics testing, 11:31243 (J;US)

TEST WELLS
See EXPLORATORY WELLS

TESTING (MATERIALS)
See MATERIALS TESTING

TETRACENE
Chemical Reaction Kinetics
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Emission Spectroscopy
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)
Radiolysis
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)

TETRACHLOROMETHANE
See CARBON TETRACHLORIDE

TETRAHYDROFURAN
Solvent Properties
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)

TETRAHYDRONAPHTHALENE
See TETRALIN

TETRALIN
Enthalpy
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)

Phase Studies
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
Vapor Pressure
Enthalpy and phase behavior of coal derived liquid mixtures. Technical progress report, January-March 1986, 11:29178 (R;US)
TETRAMETHYLETHYLENE GLYCOL
See PINACOL
TEXAS
Low-Level Radioactive Wastes
Texas goes it alone: political and legal considerations, 11:29320 (RA;US)
Radioactive Waste Facilities
Local government participation in the siting of a low-level radioactive waste disposal facility: the Texas experience, 11:29319 (RA;US)
TEXAS EXPERIMENTAL TOKAMAK
See TEXT DEVICES
TEXT DEVICES
Magnetic Field Configurations
Plasma density and poloidal field measurements on text using an injected lithium beam, 11:30971 (R;US)
Plasma Density
Plasma density and poloidal field measurements on text using an injected lithium beam, 11:30971 (R;US)
Plasma Diagnostics
Current profile diagnostic development on text using the Zeeman effect, 11:31014 (BA;US)
Cw dye laser system for Li beam spectroscopy in a tokamak, 11:30972 (R;US)
TEXTOR TOKAMAK
ICR Heating
Material and electromagnetic properties of Faraday shields for ion cyclotron heating antennas, 11:31191 (J;US)
Radio frequency vacuum feedthroughs for high-power ICRF heating applications, 11:31192 (J;US)
Plasma Simulation
Real-time evaluation of electron and current density profile parameters on TEXTOR, 11:30973 (R;DE)
Pumped Limiters
Engineering design of the ALT-II pump limiter for TEXTOR, 11:31251 (J;US)
Real Time Systems
Real-time evaluation of electron and current density profile parameters on TEXTOR, 11:30973 (R;DE)
RF Systems
Radio frequency vacuum feedthroughs for high-power ICRF heating applications, 11:31192 (J;US)
Vacuum Systems
Radio frequency vacuum feedthroughs for high-power ICRF heating applications, 11:31192 (J;US)
TFCX REACTORS
Configuration
Fusion reactor and test cell configuration, 11:31109 (J;US)
Tokamak Fusion Core Experiment maintenance study, 11:31108 (J;US)
Current Density
TFCX current density and nuclear heating limitations for superconducting Tokamaks, 11:31166 (J;US)
Design
Tokamak Fusion Core Experiment maintenance study, 11:31108 (J;US)
Tokamak Fusion Core Experiment facilities Functional and Operational Requirements, 11:31127 (J;US)
Environmental Impacts
Issues relating to the siting of tritium-fueled fusion experiments, 11:31214 (J;US)
Impurities
Impurity control and vacuum pumping system design and analysis for next-generation tokamaks, 11:31153 (J;US)
Limiters
Impact of a poloidal divertor in ignition tokamak design, 11:31186 (J;US)
Magnet Coils
Hot spots in the inboard section of the TFCX toroidal field coils, 11:31183 (J;US)
Maintenance
Tokamak Fusion Core Experiment maintenance study, 11:31108 (J;US)
Tokamak Fusion Core Experiment (TFCX) special-purpose remote maintenance systems, 11:31114 (J;US)
Modular Structures
Fusion reactor and test cell configuration, 11:31109 (J;US)
Operations Research
Tokamak Fusion Core Experiment facilities Functional and Operational Requirements, 11:31127 (J;US)
Plasma Diagnostics
Low-temperature plasma near a tokamak reactor limiter, 11:30987 (J;US)
Poloidal Field Divertors
Impact of a poloidal divertor in ignition tokamak design, 11:31186 (J;US)
Pumped Limiters
Impurity control and vacuum pumping system design and analysis for next-generation tokamaks, 11:31153 (J;US)
Radiation Hazards
Issues relating to the siting of tritium-fueled fusion experiments, 11:31214 (J;US)
Remote Handling
Tokamak Fusion Core Experiment (TFCX) special-purpose remote maintenance systems, 11:31114 (J;US)
Shields
TFCX shielding optimization, 11:31149 (J;US)
Site Selection
Issues relating to the siting of tritium-fueled fusion experiments, 11:31214 (J;US)
Specifications
Tokamak Fusion Core Experiment facilities Functional and Operational Requirements, 11:31127 (J;US)
Superconducting Magnets
Design of aggressive superconducting TFCX magnet systems, 11:31169 (J;US)
TFCX current density and nuclear heating limitations for superconducting Tokamaks, 11:31166 (J;US)
Temperature Effects
TFCX current density and nuclear heating limitations for superconducting Tokamaks, 11:31166 (J;US)
TFR TOKAMAK
ICR Heating
Theoretical and experimental study of modes associated to ion cyclotron heating on TFR, 11:30967 (R;FR;In French)
Xenon Ions
Identification of highly-ionized xenon spectra (Xe XXVI through Xe XXXI) excited in the plasma of the TFR Tokamak, 11:30966 (R;FR)
X-Ray Spectroscopy
Identification of highly-ionized xenon spectra (Xe XXVI through Xe XXXI) excited in the plasma of the TFR Tokamak, 11:30966 (R;FR)
TFTR DEVICE
See TFTR TOKAMAK
TFTR REACTORS
See TFTR TOKAMAK
TFTR TOKAMAK
Beam Injection Heating
Neutral beam orientation on the Tokamak Fusion Test Reactor, 11:31008 (J;US)
Neutral beam heating system for TFTR, 11:31198 (J;US)
Control
TFTR plasma feedback systems, 11:31004 (J;US)
Current-Drive Heating
Neutral beam orientation on the Tokamak Fusion Test Reactor, 11:31008 (J;US)
Eddy Currents
Eddy current modelling and poloidal field penetration in TFTR, 11:31260 (BA;US)
Efficiency
Neutral beam orientation on the Tokamak Fusion Test Reactor, 11:31008 (J;US)

Heating Systems
TFTR bakeout system, 11:31209 (J;US)
Magnetic Islands
Note on the Mirnov signal analysis in tokamaks, 11:30992 (J;AT)
Magnetic Susceptibility
Eddy current modelling and poloidal field penetration in TFTR, 11:31260 (BA;US)
Neutral Atom Beam Injection
Neutral beam orientation on the Tokamak Fusion Test Reactor, 11:31008 (J;US)
Neutral beam heating system for TFTR, 11:31198 (J;US)
Plasma Confinement
Confinement studies in TFTR, 11:30995 (J;US)
Plasma Diagnostics
Note on the Mirnov signal analysis in tokamaks, 11:30992 (J;AT)
Shielding analysis for the horizontal x-ray imaging system on the TFTR, 11:31001 (J;US)
TFTR bakeout system, 11:31209 (J;US)
TFTR plasma feedback systems, 11:31004 (J;US)
Plasma Scrape-Off Layer
Characterization of the TFTR plasma edge by Langmuir-calorimeter probes, 11:30980 (R;US)
Power Losses
Neutral beam orientation on the Tokamak Fusion Test Reactor, 11:31008 (J;US)

THAILAND
Biomass Conversion Plants
Implementation of biogas strategy in livestock disciplines in Thailand, 11:29475 (RA;DE)
Promotion of biogas in rural Thailand by the Population and Community Development Association (PDA), 11:29476 (RA;DE)
Government Policies
Promotion of biogas in rural Thailand by the Population and Community Development Association (PDA), 11:29476 (RA;DE)

THERMAL DECAY TIME LOG
See NEUTRON-GAMMA LOGGING

THERMAL DECOMPOSITION
See PYROLYSIS

THERMAL INSULATION
Physical Properties
Thermophysical properties of industrial insulators, 11:30021 (J;GB)
Thermal Conductivity
High temperature calorimeter performance variable study, 11:30498 (R;US)

THERMAL NEUTRONS
Multiplication Factors
Measurements and calculations of the leakage multiplication from hollow beryllium spheres, 11:31154 (J;US)

THERMAL POLLUTION
Biological Effects
Vegetational stress detection in a southeastern swamp floodplain using remote sensing and in-situ spectral measurements, 11:30620 (R;US)

THERMAL POLLUTION (AIR)
See AIR POLLUTION
THERMAL POLLUTION

THERMAL POLLUTION (WATER)
See THERMAL POLLUTION
WATER POLLUTION

THERMAL POWER PLANTS
See also COMBINED-CYCLE POWER PLANTS
FOSSIL-FUEL POWER PLANTS
GEOTHERMAL POWER PLANTS
NUCLEAR POWER PLANTS
Boiler Fuels
Elimination of quality fluctuations of milled peat in transportation phase and cost caused by these fluctuations, 11:29209 (R;FI;In Finnish)
Boilers
Water chemistry control and analytical methods at medium pressure power plants, 11:29676 (R;FI;In Finnish)
Reliability
System development of availability statistics on thermal power plants, 11:29675 (R;FI;In Finnish)
Statistical Data
System development of availability statistics on thermal power plants, 11:29675 (R;FI;In Finnish)
Water Chemistry
Water chemistry control and analytical methods at medium pressure power plants, 11:29676 (R;FI;In Finnish)

THERMAL PROPERTIES
See THERMODYNAMIC PROPERTIES

THERMAL RADIATION
Finite Element Method
Application of the finite element method to problems with heat radiation exchange, 11:30380 (R;DE;In German)

THERMAL SHIELDS
Materials Testing
Nuclear responses in INTOR plasma stabilization elements, 11:31135 (J;US)

THERMIONIC DIODES
Breakdown
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
Cathodes
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
Electric Fields
Transverse electric fields inferred from electron losses and ion beam dynamics in a Magnetically Insulated Diode, 11:31019 (BA;US)
Magnetic Insulation
Transverse electric fields inferred from electron losses and ion beam dynamics in a Magnetically Insulated Diode, 11:31019 (BA;US)
Operation
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)
Performance
Microparticles and their effects in vacuum diodes, 11:30398 (J;US)

THERMODYNAMIC PROPERTIES
See also VAPOR PRESSURE
Fluctuations
Large-scale fluctuations and the critical behavior of dilute NaCl in H_2O, 11:30197 (J;US)

THERMOELECTRIC HEAT PUMPS
See THERMOELECTRIC REFRIGERATORS

THERMOELECTRIC REFRIGERATORS
Performance
Solar thermoelectric cooling system, 11:29570 (RA;US)

THERMONUCLEAR DEVICES
See also ICF DEVICES
Cost Benefit Analysis
Computerized cost estimation spreadsheet and cost data base for fusion devices, 11:31116 (J;US)
Cost Estimation
Computerized cost estimation spreadsheet and cost data base for fusion devices, 11:31116 (J;US)
Erosion
Erosion tests of materials by energetic particle beams, 11:31233 (J;US)
First Wall
Neutronics scaling in fusion test devices, 11:31156 (J;US)
Hot Cells
Hot cell facility design for large fusion devices, 11:31232 (J;US)
Materials Testing
Operating and geometrical arrangement requirements for fusion neutronics testing, 11:31243 (J;US)
Microwave Amplifiers
An experimental study of a quasi-optical gyrotron for fusion applications, 11:31269 (BA;US)
Invited paper: high power gyrotrons for fusion applications, 11:31270 (BA;US)
Performance Testing
Engineering scaling and quantification of the test requirements for fusion nuclear technology, 11:31158 (J;US)

Physical Radiation Effects
Erosion tests of materials by energetic particle beams, 11:31233 (J;US)
Operating and geometrical arrangement requirements for fusion neutronics testing, 11:31243 (J;US)
Scaling Laws
Engineering scaling and quantification of the test requirements for fusion nuclear technology, 11:31158 (J;US)
Technology Utilization
Strategic framework for the magnetic fusion energy program, 11:31009 (J;US)

THERMONUCLEAR POWER PLANTS
Feasibility Studies
Economic potential of inertial fusion, 11:31258 (J;US)

THERMONUCLEAR REACTIONS
(For use only with the phenomenon, not with THERMONUCLEAR REACTORS.)
See also MUON-CATALYZED FUSION
Resonance Particles
Cold fusion and graser prospects, 11:31257 (J;US)
Temperature Dependence
Cold fusion and graser prospects, 11:31257 (J;US)

THERMONUCLEAR REACTOR COOLING SYSTEMS
Comparative Evaluations
A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor, 11:31222 (J;US)
Design
A comparison of Li and 83Pb-17Li primary coolant designs for the Pulse Star ICF Reactor, 11:31222 (J;US)

THERMONUCLEAR REACTOR MATERIALS
Alloy-HT-9
Poisson's ratio measurements for martensitic stainless steels, 11:31065 (RA;US)
Rapid solidification of candidate ferritic steels, 11:31064 (RA;US)
Austenitic Steels
Development of austenitic steel for fast induced-radioactivity decay, 11:31053 (RA;US)
Chromium-Molybdenum Steels
Rapid solidification of candidate ferritic steels, 11:31064 (RA;US)
Comparative Evaluations
Helium-cooled blanket designs, 11:31104 (J;US)
Qualitative comparisons of fusion reactor materials for waste handling and disposal, 11:31212 (J;US)
Computerized Simulation
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
Corrosion
Corrosion of low activation austenitic alloys and standard Fe-12 Cr-1 MoVW steel in thermally convective lithium, 11:31037 (RA;US)
Corrosion of type 316 stainless steel and 12 Cr-1 MoVW steel in flowing Pb-17 at. % Li, 11:31038 (RA;US)
Environmental effects on properties of structural alloys in flowing lithium, 11:31039 (RA;US)
Environmental effects on the properties of vanadium-base alloys, 11:31041 (RA;US)
Liquid-metal corrosion, 11:31098 (J;US)
Corrosion Fatigue
Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Data Base Management
Structural materials data base assessment for the Blanket Comparison and Selection Study, 11:31100 (J;US)
Elasticity
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)
Embrittlement
Embrittlement of 2 1/4Cr-1Mo steel by lithium and a lead-lithium liquid, 11:31234 (J;US)
Erosion
Erosion tests of materials by energetic particle beams, 11:31233 (J;US)
Experiment Planning
Interactive effects and fluence goals, 11:31246 (J;US)
Ferritic Steels
Development of ferritic steels for fast induced-radioactivity decay, 11:31063 (RA;US)
Fluid-Structure Interactions
Safety considerations of lithium lead alloy as a fusion reactor breeding material, 11:31239 (J;US)
Irradiation Procedures
US/Japan collaborative testing program in HFIR and ORR: specimen matrices for HFIR irradiation, 11:31050 (RA;US)
Materials Testing
An assessment of radiation effects in beryllium, 11:31249 (J;US)
Current state of development and expected performance of copper-lithium alloys as an impurity control system in fusion applications, 11:31163 (J;US)
Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)
Interactive effects and fluence goals, 11:31246 (J;US)
Modeling of tritium transport in lithium aluminate fusion solid breeders, 11:31141 (J;US)
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
Structural materials data base assessment for the Blanket Comparison and Selection Study, 11:31100 (J;US)
Test requirements for solid breeder blanket thermal behavior, 11:31134 (J;US)
Mechanical Properties
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Microstructure
Interstitial dislocation loop nucleation and growth and swelling produced by high-energy cascades, 11:31075 (R;US)
Physical Radiation Effects
An assessment of radiation effects in beryllium, 11:31249 (J;US)
Assessment of helium effects on swelling by reirradiation in FFTF of Path A alloys previously irradiated in HFIR, 11:31048 (RA;US)
Charpy impact test results of ferritic alloys at a fluence of 6 x 10^{22}n/cm^2, 11:31060 (RA;US)
Effect of helium on the tensile properties of several vanadium alloys, 11:31058 (RA;US)
Effect of nickel content on the aging and irradiation response of impact properties of 9 Cr-1 MoVNb and 12 Cr-1 MoVW in the absence of internal helium effects, 11:31061 (RA;US)
Effects of neutron irradiation at 450°C and 16 dpa on the properties of various commercial copper alloys, 11:31036 (RA;US)
Effects of irradiation on low activation ferritic alloys, 11:31062 (RA;US)
Effects of irradiation on the fracture toughness of HT-9, 11:31066 (RA;US)
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)
Erosion tests of materials by energetic particle beams, 11:31233 (J;US)
FFTF fusion irradiations - FFTF cycles 4-6, 11:31045 (RA;US)
Interactive effects and fluence goals, 11:31246 (J;US)
Interstitial dislocation loop nucleation and growth and swelling produced by high-energy cascades, 11:31075 (R;US)
Irradiation experiments for the US/Japan collaborative testing program in HFIR and ORR, 11:31052 (RA;US)
Microstructural examination of several commercial alloys neutron irradiated to 100 dpa, 11:31034 (RA;US)
Miniature tensile test specimens for fusion reactor irradiation studies, 11:31049 (RA;US)
Neutronics calculations in support of the ORR-MFE-4A and -4B spectral tailoring experiments, 11:31043 (RA;US)
Operation of the ORR spectral tailoring experiments (ORR-MFE-4A and ORB-MFE-4B), 11:31044 (RA;US)
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems, 11:31248 (J;US)
Radiation effects in vanadium alloys in fusion reactor environments, 11:31057 (RA;US)
Reirradiation in FFTF of swelling-resistant Path A alloys previously irradiated in HFIR, 11:31047 (RA;US)

Response of selected high strength high conductivity copper alloys to simulated fusion irradiation and temperature conditions, 11:31035 (RA;US)
Self-sustaining coatings for fusion applications-copper lithium alloys, 11:31236 (J;US)
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
Solute segregation and void formation in ion-irradiated vanadium-base alloys, 11:31056 (RA;US)
Surface effects on sputtered atoms and their angular and energy dependence, 11:31252 (J;US)
Swelling behavior of titanium-modified alloys in EBR-II, 11:31054 (RA;US)
Swelling of Fe-Cr-Mn ternary alloys in FFTF, 11:31055 (RA;US)
Tensile properties of helium-injected V-15Cr-5Ti after irradiation in EBR-II, 11:31059 (RA;US)
Test matrices for irradiation of Path A Prime Candidate and developmental alloys in FFTF, 11:31046 (RA;US)
Vanadium alloy irradiation test matrix in FFTF, 11:31051 (RA;US)

Plasticity
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)

Radioactivation
Low activation burning core reactor design studies, 11:31241 (J;US)

Radioactive Waste Disposal
Qualitative comparisons of fusion reactor materials for waste handling and disposal, 11:31212 (J;US)

Research Programs
Eighth annual progress report on special purpose materials for magnetically confined fusion reactors, 11:31067 (R;US)
U.S. Blanket Technology Programs, 11:31132 (J;US)

Reviews
Solid tritium breeder materials-Li_2O and $LiAlO_2$: a data base review, 11:31097 (J;US)
U.S. Blanket Technology Programs, 11:31132 (J;US)

Service Life
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems, 11:31248 (J;US)

Stainless Steels
Development of austenitic steel for fast induced-radioactivity decay, 11:31053 (RA;US)
Poisson's ratio measurements for martensitic stainless steels, 11:31065 (RA;US)

Stress Analysis
Elastic-plastic analysis of slender first wall structures, 11:31136 (J;US)

Stress Corrosion
Stress corrosion cracking of PCA - initial considerations and characterization of grain boundary precipitation, 11:31042 (RA;US)

Temperature Effects
Radiation damage experiments and lifetime estimates for beryllium components in fusion systems, 11:31248 (J;US)

Test Facilities
Utilization of fission reactors for fusion engineering testing, 11:31247 (J;US)

Thermal Conductivity
Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiA1O_2$ solid breeders with and without irradiation effects, 11:31255 (J;US)

Underground Disposal
Qualitative comparisons of fusion reactor materials for waste handling and disposal, 11:31212 (J;US)

Volatility
Elemental volatility of HT-9 fusion reactor alloy, 11:31240 (J;US)

THERMONUCLEAR REACTOR WALLS
See also FIRST WALL

Leakage Current
The influence of leakage currents on MHD pressure drop, 11:31113 (J;US)

Magnetohydrodynamics
The influence of leakage currents on MHD pressure drop, 11:31113 (J;US)

THERMONUCLEAR REACTORS
For use in cases where certain aspects of either hypothetical or real thermonuclear reactors are discussed.
See also D-T REACTORS
ION BEAM FUSION REACTORS
LASER FUSION REACTORS
MAGNETIC MIRROR TYPE REACTORS
PULSED FUSION REACTORS
STEADY-STATE FUSION REACTORS
TOKAMAK TYPE REACTORS

Breeding Blankets
Experimental facility for studying MHD effects in liquid metal cooled blankets, 11:31110 (J;US)
Helium-cooled, flibe breeder, beryllium multiplier blanket, 11:31103 (J;US)
Helium-cooled blanket designs, 11:31104 (J;US)
Magnetohydrodynamic considerations for the design of self-cooled liquid-metal fusion reactor blankets, 11:31111 (J;US)
MHD flow control as a design approach for self-cooled liquid-metal blankets of magnetic confinement fusion reactors, 11:31112 (J;US)
The influence of leakage currents on MHD pressure drop, 11:31113 (J;US)
Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket, 11:31174 (J;US)

Breeding Ratio
Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket, 11:31174 (J;US)

Bundle Divertors
A comparison study of toroidal-field divertors for a Compact Reversed-Field Pinch Reactor, 11:31176 (J;US)

Commercialization
How safe is safe enough? The relation of environmental characteristics and economic competitiveness in fusion-reactor design, 11:31213 (J;US)

Computer-Aided Design
Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket, 11:31174 (J;US)

Containment Buildings
The effectiveness of building wall boration in controlling the neutron responses in a fusion facility, 11:31242 (J;US)

Control
Plasma instrumentation for fusion power reactor control, 11:31003 (J;US)

Control Systems
The engineering and material aspects of impurity control systems, 11:31139 (J;US)

Cost
Directions for improved fusion reactors, 11:31076 (R;US)

Cost Estimation
Cost assessment of a generic magnetic fusion reactor, 11:31085 (J;US)

Data Covariances
Status of methods, codes and applications for sensitivity and uncertainty analysis, 11:31125 (J;US)

Design
Design of a helium-cooled molten-salt fusion breeder, 11:31143 (J;US)
Fusion-power-core design of a compact Reversed-Field Pinch Reactor (CRFPR), 11:31175 (J;US)
Prospects for improved fusion reactors, 11:31074 (R;US)
Recent progress in stellarator reactor conceptual design, 11:31178 (J;US)

Economic Analysis
How safe is safe enough? The relation of environmental characteristics and economic competitiveness in fusion-reactor design, 11:31213 (J;US)

Environmental Impacts
How safe is safe enough? The relation of environmental characteristics and economic competitiveness in fusion-reactor design, 11:31213 (J;US)

Evaluated Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)

Experiment Planning
Experimental techniques and measurement accuracies, 11:31157 (J;US)

Experimental Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)
Feasibility Studies
Cost assessment of a generic magnetic fusion reactor, 11:31085 (J;US)
First Wall
Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket, 11:31174 (J;US)
Heliotron
Recent progress in stellarator reactor conceptual design, 11:31178 (J;US)
ICR Heating
Materials problems for highly irradiated ICRH Launchers in fusion reactors, 11:31195 (J;US)
Impurities
An impurity control test facility (ICTF) for the study of fusion reactor/plasma edge materials, 11:31161 (J;US)
Inertial Confinement
Inertial fusion reactors and magnetic fields, 11:31228 (J;US)
Information Needs
Nuclear data needs for fusion energy development, 11:31124 (J;US)
Ions
Application of polarized ions to fusion reactors, 11:30974 (RA;JP)
Magnetic Fields
Inertial fusion reactors and magnetic fields, 11:31228 (J;US)
Materials Testing
Identification and characterization of the key issues of fusion nuclear technology, 11:31245 (J;US)
Utilization of fission reactors for fusion engineering testing, 11:31247 (J;US)
Neutron Flux
Experimental techniques and measurement accuracies, 11:31157 (J;US)
Neutron Transport
Experimental techniques and measurement accuracies, 11:31157 (J;US)
Nuclear Data Collections
Nuclear data needs for fusion energy development, 11:31124 (J;US)
Parametric Analysis
Status of methods, codes and applications for sensitivity and uncertainty analysis, 11:31125 (J;US)
Performance
Status of methods, codes and applications for sensitivity and uncertainty analysis, 11:31125 (J;US)
Performance Testing
Identification and characterization of the key issues of fusion nuclear technology, 11:31245 (J;US)
Plasma Diagnostics
Low activation diagnostic equipment design studies, 11:31002 (J;US)
Plasma instrumentation for fusion power reactor control, 11:31003 (J;US)
Poloidal Field Divertors
A comparison study of toroidal-field divertors for a Compact Reversed-Field Pinch Reactor, 11:31176 (J;US)
Productivity
Design of a helium-cooled molten-salt fusion breeder, 11:31143 (J;US)
Radiation Hazards
How safe is safe enough? The relation of environmental characteristics and economic competitiveness in fusion-reactor design, 11:31213 (J;US)
Radiation Protection
Low activation burning core reactor design studies, 11:31241 (J;US)
Radioactive Wastes
Qualitative comparisons of fusion reactor materials for waste handling and disposal, 11:31212 (J;US)
Reactor Safety
How safe is safe enough? The relation of environmental characteristics and economic competitiveness in fusion-reactor design, 11:31213 (J;US)
Research Programs
Identification and characterization of the key issues of fusion nuclear technology, 11:31245 (J;US)
Reverse-Field Pinch
A comparison study of toroidal-field divertors for a Compact Reversed-Field Pinch Reactor, 11:31176 (J;US)
Fusion-power-core design of a compact Reversed-Field Pinch Reactor (CRFPR), 11:31175 (J;US)
Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket, 11:31174 (J;US)
Sensitivity Analysis
Status of methods, codes and applications for sensitivity and uncertainty analysis, 11:31125 (J;US)
Shielding Materials
Low activation burning core reactor design studies, 11:31241 (J;US)
Shields
Two-dimensional TBR calculations for conceptual Compact Reversed-Field Pinch Reactor blanket, 11:31174 (J;US)
Site Selection
Fusion facility siting considerations, 11:31215 (J;US)
Stellarators
Recent progress in stellarator reactor conceptual design, 11:31178 (J;US)
Structural Models
Cost assessment of a generic magnetic fusion reactor, 11:31085 (J;US)
Test Facilities
Experimental facility for studying MHD effects in liquid metal cooled blankets, 11:31110 (J;US)
Theoretical Data
Annual progress report on nuclear data, 1984. Volume 3, 11:30891 (R;BE)

THERMONUCLEAR WEAPONS
See NUCLEAR WEAPONS

THETA PINCH
Plasma Confinement
Invited paper: confinement scaling, equilibrium, and stabilization studies in FRX-C, 11:31264 (BA;US)
Scaling Laws
Invited paper: confinement scaling, equilibrium, and stabilization studies in FRX-C, 11:31264 (BA;US)

THF
See TETRAHYDROFURAN

THIN FILMS
Fabrication
Method for production of ceramic oxide and carbide bodies by polymer inclusion and decomposition, 11:30419 (P;US)
Optics
Optical effects of thin film adhesives in multijunction solar cells, 11:29549 (BA;US)

THIO COMPOUNDS
See ORGANIC SULFUR COMPOUNDS

THIOCYANATES
Photolysis
Photoelectrochemistry in particulate systems. 3. Phototransformations in the colloidal TiO_2-thiocyanate system, 11:30173 (J;US)

THIOCYANIDES
See THIOCYANATES

THIOETHERS
See SULFIDES

THORAX
See CHEST

THORIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)

THORIUM 228
Radioecological Concentration
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)

THORIUM 229
Thermal Fission
Quasi-particle excitations in low energy fission, 11:30924 (R;FR)
THORIUM 230
Radioecological Concentration
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Tissue Distribution
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
THORIUM 232
Radioecological Concentration
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
Tissue Distribution
Studies of transport pathways of Th, rare earths, Ra-228, and Ra-226 from soil to plants and farm animals. Progress report, April 1, 1985-February 28, 1986, 11:30580 (R;US)
THORIUM COMPLEXES
Catalytic Effects
Supported f-element complexes: surface chemistry and catalysis. Final report, August 15, 1984-January 14, 1986, 11:30195 (R;US)
Chemical Preparation
C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes, 11:30318 (J;US)
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS$_5$. A unique example of the twist-boat conformation of the MS$_5$ ring, 11:30319 (J;US)
Synthesis and X-ray structure of (C_5Me_5)$_2$Th(μ-PPh_2)$_2$Pt(PMe_3): a complex with a thorium-platinum bond, 11:30316 (J;US)
Chemical Properties
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS$_5$. A unique example of the twist-boat conformation of the MS$_5$ ring, 11:30319 (J;US)
Chemical Reactions
C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes, 11:30318 (J;US)
Crystal Structure
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS$_5$. A unique example of the twist-boat conformation of the MS$_5$ ring, 11:30319 (J;US)
Synthesis and X-ray structure of (C_5Me_5)$_2$Th(μ-PPh_2)$_2$Pt(PMe_3): a complex with a thorium-platinum bond, 11:30316 (J;US)
Electronic Structure
C-H activation mechanisms and regioselectivity in the cyclometalation reactions of bis(pentamethylcyclopentadienyl)thorium dialkyl complexes, 11:30318 (J;US)
Molecular Structure
Preparation and characterization of the first organoactinide polysulfide (eta^5-C_5Me_5)$_2$ThS$_5$. A unique example of the twist-boat conformation of the MS$_5$ ring, 11:30319 (J;US)
THORIUM COMPOUNDS
Chemical Preparation
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of Th(CH_2Ph)$_4$($Me_2PCH_2CH_2PMe_2$) and U(CH_2Ph)$_3$Me($Me_2PCH_2CH_2PMe_2$), 11:30273 (J;US)
Crystal Structure
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of Th(CH_2Ph)$_4$($Me_2PCH_2CH_2PMe_2$) and U(CH_2Ph)$_3$Me($Me_2PCH_2CH_2PMe_2$), 11:30273 (J;US)
Molecular Structure
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of Th(CH_2Ph)$_4$($Me_2PCH_2CH_2PMe_2$) and U(CH_2Ph)$_3$Me($Me_2PCH_2CH_2PMe_2$), 11:30273 (J;US)
THORIUM CYCLE
Economics
Closed thorium cycles in the pebble bed HTR, 11:29775 (R;DE)
THORIUM D
See LEAD 208
THREE MILE ISLAND-2 REACTOR
Dauphin County, Pennsylvania, USA
Auxiliary Water Systems
TMI-2 defueling filter development tests, 11:29762 (RA;US)
Decontamination
Three Mile Island Unit 2 dry-canal defueling water cleanup system: an update, 11:29764 (RA;US)
TMI-2 defueling filter development tests, 11:29762 (RA;US)
Demineralizers
Processing and removal of the Three Mile Island makeup and purification system resins, 11:29832 (RA;US)
Radioactive Waste Disposal
Institutional agreements and interaction for research and disposition of nuclear waste from Three Mile Island, 11:29831 (RA;US)
Radioactive Waste Facilities
Three Mile Island Unit 2 dry-canal defueling water cleanup system: an update, 11:29764 (RA;US)
Radioactive Waste Processing
Processing and removal of the Three Mile Island makeup and purification system resins, 11:29832 (RA;US)
Radioactive Wastes
Structural analysis of TMI-2 defueling canisters, 11:29759 (RA;US)
TMI-2 defueling canister reactivity calculations, 11:29760 (RA;US)
Research Programs
US Department of Energy Three Mile Island research and development program. 1985 annual report, 11:29843 (R;US)
Spent Fuel Casks
Defueling canister designs for the TMI-2 core removal program, 11:29761 (RA;US)
Structural analysis of TMI-2 defueling canisters, 11:29759 (RA;US)
TMI-2 defueling canister reactivity calculations, 11:29760 (RA;US)
THYMIDINE
Chemical Preparation
Biomedical research with cyclotron produced radionuclides. Final report, February 1977-March 1986, 11:30662 (R;US)
THYROID
Biological Radiation Effects
Thyroid effects, 11:30695 (RA;US)
Neoplasms
Thyroid effects, 11:30695 (RA;US)
TIBET
Atmospheric Circulation
Plateau monsoons of the northern hemisphere: a comparison between North America and Tibet, 11:30522 (J;US)
TIGHT SANDS
See SANDSTONES
TIME PROJECTION CHAMBERS
See PROJECTION SPARK CHAMBERS
TIME-OF-FLIGHT SPECTROMETERS
Performance
Improved constant-Q spectrometer for pulsed neutron sources, 11:30486 (J;NL)
Pulsed Neutron Techniques
Improved constant-Q spectrometer for pulsed neutron sources, 11:30486 (J;NL)
TIME-REVERSAL INVARIANCE
See T INVARIANCE
TIME-SERIES ANALYSIS
Uses
Use of time series methods for estimating hazard, 11:30599 (RA;US)

TIN
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
TIN 111
De-Excitation
Gamma-decay of the 1gsub(9/2) and 2p inner-hole states in ^{111}Sn via the ^{112}Sn(^{3}He) reaction at 32 MeV, 11:30911 (R;FR)
TIN 112 TARGET
Helium 3 Reactions
Gamma-decay of the 1gsub(9/2) and 2p inner-hole states in ^{111}Sn via the ^{112}Sn(^{3}He) reaction at 32 MeV, 11:30911 (R;FR)
TIPVANE ROTORS
Performance
Analytical theory for rotor-tipvane performance and comparison with experimental results, 11:29656 (RA;DE)
Testing
Analytical theory for rotor-tipvane performance and comparison with experimental results, 11:29656 (RA;DE)
TISSUE-EQUIVALENT DETECTORS
Computer-Aided Design
A new type of REM measuring instrument, 11:30440 (J;US)
TITANIUM
Heat Transfer
Heat transfer coefficients for lead matrixing in disposal containers for used reactor fuel, 11:30071 (R;CA)
TITANIUM ADDITIONS
See also INCOLOY 800H
Physical Radiation Effects
Swelling behavior of titanium-modified alloys in EBR-II, 11:31054 (RA;US)
TITANIUM ALLOYS
See also TITANIUM ADDITIONS
Corrosion
Environmental effects on the properties of vanadium-base alloys, 11:31041 (RA;US)
Corrosion Resistance
Corrosion behaviour of container materials for geological disposal of high level radioactive waste, 11:30092 (R;FR)
Hydridation
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)
Physical Radiation Effects
Effect of neutron irradiation on the tensile properties and microstructure of several vanadium alloys, 11:30085 (R;US)
Tensile properties of helium-injected V-15Cr-5Ti after irradiation in EBR-II, 11:31059 (RA;US)
TITANIUM BORIDES
Phase Studies
Secondary fluorescence effects on x-ray microanalysis, 11:30141 (J;US)
Sintering
Secondary fluorescence effects on x-ray microanalysis, 11:30141 (J;US)
TITANIUM HYDRIDES
Physical Radiation Effects
Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)
TITANIUM OXIDES
See also HOLLANDITE
Catalytic Effects
Use of organic molecules as mechanistic probes for semiconductor-mediated photoelectrochemical oxidations: bromide oxidation, 11:30265 (J;US)
Colloids
Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue, 11:30284 (J;US)
Emission Spectroscopy
Photoelectrochemistry at particulate systems. 4. Photosensitization of a TiO_2 semiconductor with a chlorophyll analogue, 11:30284 (J;US)
Optical Properties
Reduction of substrate interference in Raman spectroscopy of submicron titania coatings, 11:30136 (J;US)
Photolysis
Photoelectrochemistry in particulate systems. 3. Phototransformations in the colloidal TiO_2-thiocyanate system, 11:30173 (J;US)
Raman Spectroscopy
Reduction of substrate interference in Raman spectroscopy of submicron titania coatings, 11:30136 (J;US)
Surface Area
Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)
TMPN
See HYDROXY COMPOUNDS
ORGANIC OXYGEN COMPOUNDS
TMR REACTORS
Breeding Blankets
A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts, 11:31095 (J;US)
Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)
Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study, 11:31094 (J;US)
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Safety evaluation of the Blanket Comparison and Selection Study, 11:31107 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)
Computer-Aided Design
Plasma heating systems module for TMRSC, 11:31211 (J;US)
Tandem Mirror Reactor Systems Code (TMRSC), 11:31117 (J;US)
Coolants
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Demonstration Programs
Evolution of the Fusion Power Demonstration tandem mirror reactor configuration, 11:31128 (J;US)
Design
A module for testing a lithium cooled tokamak blanket in a tandem mirror test reactor, 11:31152 (J;US)
Evolution of the Fusion Power Demonstration tandem mirror reactor configuration, 11:31128 (J;US)
Plasma engineering for MINIMARS: a small commercial tandem mirror reactor with octopole plugs, 11:31168 (J;US)
Energy Balance
Tandem Mirror Reactor power balance studies, 11:31115 (J;US)
Energy Efficiency
Tandem Mirror Reactor power balance studies, 11:31115 (J;US)
First Wall
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)
Magnetic Fields
Physics-magnetics trade studies for tandem mirror reactors, 11:30997 (J;US)
Mission Analysis
Evolution of the Fusion Power Demonstration tandem mirror reactor configuration, 11:31128 (J;US)
Net Energy
Physics-magnetics trade studies for tandem mirror reactors, 11:30997 (J;US)
Neutron Flux
Neutronics activities for next generation devices, 11:31244 (J;US)
Octupolar Configurations
Plasma engineering for MINIMARS: a small commercial tandem mirror reactor with octopole plugs, 11:31168 (J;US)
Parametric Analysis
Neutronics activities for next generation devices, 11:31244 (J;US)
Plasma Heating
FPD plasma heating systems, 11:31208 (J;US)

Heating and pumping studies in the end cells of tandem-mirror reactors, 11:31011 (BA;US)
Plasma heating systems module for TMRSC, 11:31211 (J;US)
Pumping
Heating and pumping studies in the end cells of tandem-mirror reactors, 11:31011 (BA;US)
Reactor Safety
Safety evaluation of the Blanket Comparison and Selection Study, 11:31107 (J;US)
Reviews
Neutronics activities for next generation devices, 11:31244 (J;US)
Size
Plasma engineering for MINIMARS: a small commercial tandem mirror reactor with octopole plugs, 11:31168 (J;US)
Thermonuclear Reactor Materials
Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)

TMX DEVICES
Computerized Simulation
Modeling and optimization of operating parameters for a test-cell option of the Fusion Power Demonstration-II tandem mirror design, 11:31130 (J;US)
Plasma engineering models of tandem mirror devices with high-field test-cell inserts, 11:30996 (J;US)
Data Processing
Database tools for enhanced analysis of TMX-U data. Revision 1, 11:30984 (R;US)
Demonstration Programs
Modeling and optimization of operating parameters for a test-cell option of the Fusion Power Demonstration-II tandem mirror design, 11:31130 (J;US)
ICR Heating
ICRF heating of passing ions in TMX-U, 11:30985 (R;US)
Neutral Atom Beam Injection
Determining plasma-fueling sources with an end-loss ion spectrometer. Revision 1, 11:31082 (R;US)
Summary abstract: control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment, 11:31259 (J;US)
Operation
Modeling and optimization of operating parameters for a test-cell option of the Fusion Power Demonstration-II tandem mirror design, 11:31130 (J;US)
Plasma Confinement
Plasma engineering models of tandem mirror devices with high-field test-cell inserts, 11:30996 (J;US)
Pressure Control
Summary abstract: control of gas input and background pressure in the end plug regions of the TMX-U thermal barrier experiment, 11:31259 (J;US)
Reactor Fueling
Determining plasma-fueling sources with an end-loss ion spectrometer. Revision 1, 11:31082 (R;US)

TOGO
Energy Policy
Togo - energy situation 1984, 11:29928 (R;DE;In German)
Energy Supplies
Togo - energy situation 1984, 11:29928 (R;DE;In German)

TOKAMAK DEVICES
See also ALCATOR DEVICE
ASDEX TOKAMAK
DOUBLET-3 DEVICE
TEXT DEVICES
TEXTOR TOKAMAK
TFR TOKAMAK
Alpha Particles
Method for determining fast-alpha-particle confinement in tokamak plasmas using resonant nuclear reactors, 11:30978 (R;US)
Design
A tokamak ignition/burn experimental research device, 11:31123 (J;US)
Diagnostic Techniques
Method for determining fast-alpha-particle confinement in tokamak plasmas using resonant nuclear reactors, 11:30978 (R;US)
ECR Heating
Electron cyclotron heating at down-shifted frequencies in existing tokamak devices, 11:30988 (J;AT)
ICR Heating
Electric and magnetic excitation of ICRF waves: eigenmodes and wave packets, 11:31023 (BA;US)
Plasma Density
Tokamak plasma density fluctuation studies using a multichannel scattering apparatus, 11:31015 (BA;US)
Plasma Diagnostics
Tokamak plasma density fluctuation studies using a multichannel scattering apparatus, 11:31015 (BA;US)
Plasma Macroinstabilities
Finite-beta global MHD stabilities for circular and highly-elongated tokamaks with and without poloidal divertors, 11:30970 (R;US)
Plasma Pressure
Pressure limits of an axisymmetric torus, 11:30981 (R;US)
Pumped Limiters
Neutral pumping rates for a next step tokamak ignition device, 11:31235 (J;US)
Pumping
Neutral pumping rates for a next step tokamak ignition device, 11:31235 (J;US)
Sizing
A tokamak ignition/burn experimental research device, 11:31123 (J;US)
Thermonuclear Ignition
A tokamak ignition/burn experimental research device, 11:31123 (J;US)
Neutral pumping rates for a next step tokamak ignition device, 11:31235 (J;US)

TOKAMAK FONTENAY-AUX-ROSES
See TFR TOKAMAK

TOKAMAK FUSION CORE EXPERIMENT
See TFCX REACTORS

TOKAMAK FUSION TEST REACTOR
See TFTR TOKAMAK

TOKAMAK TYPE REACTORS
See also DOUBLET REACTORS
INTOR TOKAMAK
ISX TOKAMAK
JET TOKAMAK
PLT DEVICES
TFCX REACTORS
TFTR TOKAMAK
Acoustic Heating
Alpha-driven fast magnetosonic wave heating in tokamak plasmas, 11:31007 (J;US)
Breeding Blankets
A comparative multidimensional nuclear analysis of candidate blanket designs for Tokamak and tandem mirror reactor concepts, 11:31095 (J;US)
A module for testing a lithium cooled tokamak blanket in a tandem mirror test reactor, 11:31152 (J;US)
Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)
Energy deposition and shielding requirements for all concepts of the Blanket Comparison and Selection Study, 11:31094 (J;US)
First wall and blanket design for a high wall loading compact tokamak power reactor, 11:31151 (J;US)
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Safety evaluation of the Blanket Comparison and Selection Study, 11:31107 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)
Commercialization
System studies of commercial Tokamak reactors with resistive magnets, 11:31165 (J;US)
Comparative Evaluations
A comparison of burn cycle options for Tokamak reactors, 11:31197 (J;US)
Design options for commercial reactors with resistive magnets, 11:31122 (J;US)

Control Theory
Optimal control theory applied to fusion plasma thermal stabilization, 11:31000 (J;US)
Coolants
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Current-Drive Heating
A comparison of burn cycle options for Tokamak reactors, 11:31197 (J;US)
Design
Compact ignition tokamak design studies: design and analysis listing and examples. Documentation listing, 11:31068 (R;US)
Compact ignition tokamak design studies, 11:31025 (R;US)
Compact ignition tokamak design studies, 11:31024 (R;US)
Compact minimum cost ignition test reactor, 11:31173 (J;US)
Configuration development and structural assessment of the FEDC ignitor concept, 11:31030 (R;US)
Design options for commercial reactors with resistive magnets, 11:31122 (J;US)
Electromagnets
Design options for commercial reactors with resistive magnets, 11:31122 (J;US)
First Wall
First wall and blanket design for a high wall loading compact tokamak power reactor, 11:31151 (J;US)
Structural analysis under the Blanket Comparison and Selection Study, 11:31099 (J;US)
Vanadium alloys for fusion reactor first wall application, 11:30089 (R;US)
Ion Wave Instability
Alpha-driven fast magnetosonic wave heating in tokamak plasmas, 11:31007 (J;US)
Joule Heating
A comparison of burn cycle options for Tokamak reactors, 11:31197 (J;US)
Langmuir Probe
Edge turbulence in the PRETEXT Tokamak, 11:31018 (BA;US)
Limiters
Sputtering performance of a pumped limiter for an ignition tokamak, 11:31090 (J;US)
Magnet Coils
A demountable toroidal field coil system for a commercial tokamak reactor, 11:31172 (J;US)
Maintenance
A demountable toroidal field coil system for a commercial tokamak reactor, 11:31172 (J;US)
Maintainability features of the compact ignition tokamak, 11:31031 (R;US)
Neutron Flux
Neutronics activities for next generation devices, 11:31244 (J;US)
Optimal Control
Optimal control theory applied to fusion plasma thermal stabilization, 11:31000 (J;US)
Parametric Analysis
Neutronics activities for next generation devices, 11:31244 (J;US)
Plasma Disruption
Tokamak arc damage, 11:31005 (J;US)
Poloidal Field Divertors
Poloidal divertor systems for impurity and particle control in ignition Tokamaks, 11:31138 (J;US)
Pumped Limiters
Poloidal divertor systems for impurity and particle control in ignition Tokamaks, 11:31138 (J;US)
Reactor Safety
Safety evaluation of the Blanket Comparison and Selection Study, 11:31107 (J;US)
Reviews
Neutronics activities for next generation devices, 11:31244 (J;US)
New directions in Tokamak reactors, 11:31121 (J;US)
Shields
Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)
Shield design for next-generation, low-neutron-fluence, superconducting tokamaks, 11:31150 (J;US)
Superconducting Magnets
Shield design for next-generation, low-neutron-fluence, superconducting tokamaks, 11:31150 (J;US)
System studies of commercial Tokamak reactors with resistive magnets, 11:31165 (J;US)
Systems Analysis
System studies of compact ignition tokamaks, 11:31029 (R;US)
Temperature Control
Optimal control theory applied to fusion plasma thermal stabilization, 11:31000 (J;US)
Thermonuclear Ignition
Compact minimum cost ignition test reactor, 11:31173 (J;US)
Sputtering performance of a pumped limiter for an ignition tokamak, 11:31090 (J;US)
Thermonuclear Reactor Materials
Design of self-cooled, liquid-metal blankets for tokamak and tandem mirror reactors, 11:31105 (J;US)
Overview of the Blanket Comparison and Selection Study, 11:31106 (J;US)
Turbulence
Edge turbulence in the PRETEXT Tokamak, 11:31018 (BA;US)

TOLUENE
Chemical Reaction Kinetics
Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985, 11:30234 (R;US)
Pyrolysis
Direct determination of atom and radical concentrations in thermal reactions of hydrocarbons and other gases. Progress report, January 1-December 31, 1984, 11:30322 (R;US)
Solvent Properties
Effect of maceral properties on the comminution of coal. Technical progress report, January 1-March 31, 1986, 11:29204 (R;US)

TOPO
Solvent Properties
Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid, 11:29424 (J;NL)

TOTAL-ABSORPTION SPECTROMETERS
See SHOWER COUNTERS

TOXICITY
Meetings
Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 1. Extrapolation from animals to man, 11:30716 (R;US)
Proceedings: new directions on the extrapolation of health risks from animals to man. Volume 2. Toxicokinetics, 11:30717 (R;US)
Mitigation
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)

TOXINS
Amino Acid Sequence
Molecular biochemistry, 11:30623 (RA;ZA;In Afrikaans)
Structural Chemical Analysis
Molecular biochemistry, 11:30623 (RA;ZA;In Afrikaans)

TPC
See PROJECTION SPARK CHAMBERS

TRACER TECHNIQUES
Inert and reacting tracers for reservoir sizing, 11:29632 (RA;US)

TRANSBOUNDARY POLLUTION
See TRANSFRONTIER POLLUTION

TRANSFER (ELECTRON)
See ELECTRON TRANSFER

TRANSFER (ENERGY)
See ENERGY TRANSFER

TRANSFER (HEAT)
See HEAT TRANSFER

TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION

TRANSFER REACTIONS
For nuclear reactions only; see also CHARGE EXCHANGE and ELECTRON TRANSFER.
Lectures
Heavy ion induced fusion/fission and barrier penetration. Lecture notes, 11:30929 (R;AU)
TRANSFORMATIONS (PHASE)
See PHASE TRANSFORMATIONS
TRANSFORMERS
Evaluation
400 Hz welding transformer gun assembly evaluation. Final report, 11:30394 (R;US)
400 Hz welding transformer gun assembly evaluation. Final report, 11:30395 (R;US)
Hz Range
400 Hz welding transformer gun assembly evaluation. Final report, 11:30395 (R;US)
TRANSFRONTIER POLLUTION
For nonradioactive pollution only; for radioactive contamination use TRANSFRONTIER CONTAMINATION.
Meetings
Perspectives on nonpoint source pollution - proceedings of a national conference, 11:29188 (R;US)
TRANSIENT SPECIES
See REACTION INTERMEDIATES
TRANSIENTS
Computerized Simulation
Plant analyzer development for high-speed interactive simulation of BWR plant transients, 11:29828 (R;US)
TRANSITIONS (PHASE)
See PHASE TRANSFORMATIONS
TRANSMISSION (HEAT)
See HEAT TRANSFER
TRANSPORT (ENVIRONMENTAL)
See ENVIRONMENTAL TRANSPORT
TRANSPORT (GAMMA)
See PHOTON TRANSPORT
TRANSPORT (PHOTON)
See PHOTON TRANSPORT
TRANSPORT (RADIATION)
See RADIATION TRANSPORT
TRANSPORT (REACTION PRODUCT)
See REACTION PRODUCT TRANSPORT SYSTEMS
TRANSPORT THEORY
Iterative Methods
Parallel S /sub n/ iteration schemes, 11:30950 (J;US)
Parallel Processing
Parallel S /sub n/ iteration schemes, 11:30950 (J;US)
TRANSURANIUM WASTES
See ALPHA-BEARING WASTES
TREES
See also MAPLES
Biological Stress
Vegetational stress detection in a southeastern swamp floodplain using remote sensing and in-situ spectral measurements, 11:30620 (R;US)
TRIBOLIUM
Biological Radiation Effects
Radiobiological studies on eggs of the rice weevil (Tribolium confusum) after exposure to heavy primary particles of the cosmic radiation, 11:30693 (R;DE;In German)
TRIGA TYPE REACTORS
Annular Fuel Elements
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
Fuel Rods
Air coolability of TRIGA reactors following a loss-of-coolant accident, 11:29864 (R;US)
Research program: the investigation of heat transfer and fluid flow at low pressure, 11:29863 (R;US)
TRIOCTYLPHOSPHINE OXIDE
See TOPO
TRIPHENYLMETHANE DYES
Absorption Spectroscopy
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
Isomers
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
TRIPLET PARTICLES
See QUARKS
TRISTAN PROJECT
See TRISTAN STORAGE RINGS
TRISTAN STORAGE RINGS
Transposable Ring Intersecting STorage Accelerators in Nippon.
Meetings
Proceedings of the first TRISTAN phase II workshop, 11:30831 (R;JP)
TRITIUM
Beta-Minus Decay
Electron antineutrino mass from the β-decay of ^3H, 11:30826 (RA;JP)
Breeding
A systematic methodology for estimating direct capital costs for blanket tritium processing systems, 11:31145 (J;US)
Measuring nanocurie quantities of tritium bred in metallic lithium and lithium oxide samples, 11:31204 (J;US)
Tritium breeding material : o $LiAlO_2$, 11:31160 (J;US)
Breeding Ratio
An assessment of tritium breeding requirements based on the tritium fuel cycle, 11:31088 (J;US)
Deuterium-tritium fuel self-sufficiency in fusion reactors, 11:31086 (J;US)
Uncertainties in prediction of tritium breeding in candidate blanket designs due to present uncertainties in nuclear data base, 11:31087 (J;US)
Containment
An assessment of problems associated with tritium containment, 11:31096 (J;US)
Emergency containment system, 11:29439 (RA;US)
Counter Current
Counter current extraction system for tritium recovery from 17Li-83Pb, 11:31144 (J;US)
Diffusion
Modeling of tritium transport in lithium aluminate fusion solid breeders, 11:31141 (J;US)
Summary abstract: reduction of tritium permeation through iron using aluminum ion implantation, 11:30113 (J;US)
Tritium breeding material : o $LiAlO_2$, 11:31160 (J;US)
Dose Rates
Calculation of dose rates from critical radionuclides in low-level radioactive waste disposal, 11:29444 (RA;US)
Extraction
Counter current extraction system for tritium recovery from 17Li-83Pb, 11:31144 (J;US)
Isotope Effects
Mound activities in chemical and physical research: July-December 1985, 11:30196 (R;US)
Neutral Beam Sources
Tritium system design for the mirror reactors FPD-I, FPD-II, and FPD-III, 11:31203 (J;US)
NMR Spectra
The determination of deuterium and tritium in effluent wastewater by pulsed nuclear magnetic resonance spectroscopy, 11:31101 (J;US)
Personnel Monitoring
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)
Production
Fuel assembly for the production of tritium in light water reactors, 11:29755 (P;US)
Radiation Monitoring
Emergency containment system, 11:29439 (RA;US)
Management of high specific activity tritiated liquid wastes, 11:29407 (RA;US)
Radioactive Waste Disposal
Conceptual design for the injection of tritiated effluents into deep geological formations, 11:29361 (RA;US)
Radioactive Waste Processing
Solidification of enriched tritium from reprocessing, 11:29402 (R;DE;In German)

Radioecological Concentration
Surface tritium contamination studies, 11:29437 (RA;US)
Tritium surface contamination, 11:31102 (J;US)
Reviews
Tritium technology review, 11:31196 (J;US)
Solidification
Solidification of enriched tritium from reprocessing, 11:29402 (R;DE;In German)
Surface Contamination
Tritium surface contamination, 11:31102 (J;US)
TRITIUM PRODUCTION REACTORS
Design
An ICF Tritium production reactor, 11:31210 (J;US)
Inertial Confinement
An ICF Tritium production reactor, 11:31210 (J;US)
TRITIUM RECOVERY
In thermonuclear reactors and/or devices.
Low temperature distillation system for tritium recovery, 11:29406 (RA;US)
TRITIUM SYSTEMS TEST ASSEMBLY
Personnel
Tritium Systems Test Assembly operator training program, 11:31202 (J;US)
Quality Assurance
Tritium Systems Test Assembly Quality Assurance Program, 11:31201 (J;US)
TROUT
Environmental Effects
Control of productivity and population characteristics in aquatic communities. Progress report, 1 September 1982-31 August 1983, 11:30594 (R;US)
Population Dynamics
Use of a population model for estimating hazards: interpretation of low pH bioassay results with respect to Norwegian trout populations, 11:30598 (RA;US)
TRU WASTES
See ALPHA-BEARING WASTES
TRUCKS
Design
Technological advances in vehicle design: Ford energy report, 11:30047 (B;GB)
Meetings
Technological advances in vehicle design: Ford energy report, 11:30047 (B;GB)
TRX-1
See REVERSE-FIELD PINCH
TSTA
See TRITIUM SYSTEMS TEST ASSEMBLY
TUBES
For objects of tubular shape; not for DRIFT TUBES, ELECTRON TUBES or IMAGE STORAGE TUBES.
Intergranular Corrosion
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
Stress Corrosion
1984 Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing. Proceedings, 11:29765 (R;US)
TUBES (CONDUITS)
See PIPES
TUFF
Caliper Logging
Preliminary analysis of geophysical logs from the WT series of drill holes, Yucca Mountain, Nye County, Nevada (NNWSI project), 11:30748 (R;US)
Flow Models
Fluid flow in a fractured rock mass (NNWSI Project), 11:30742 (R;US)
Fluid Flow
Fluid flow in a fractured rock mass (NNWSI Project), 11:30742 (R;US)
Fracturing
Effects of wellbore liquids in propellant-based fracturing, 11:29251 (R;US)
Gamma Logging
Preliminary analysis of geophysical logs from the WT series of drill holes, Yucca Mountain, Nye County, Nevada (NNWSI project), 11:30748 (R;US)
Hydrothermal Alteration
Expected thermal and hydrothermal environments for waste emplacement holes based on G-tunnel heater experiments (NNWSI project), 11:30749 (R;US)
Neutron Logging
Preliminary analysis of geophysical logs from the WT series of drill holes, Yucca Mountain, Nye County, Nevada (NNWSI project), 11:30748 (R;US)
Permeability
Permeability and pore-fluid chemistry of the Bullfrog Tuff in a temperature gradient: summary of results, 11:30761 (R;US)
Resistivity Logging
Preliminary analysis of geophysical logs from the WT series of drill holes, Yucca Mountain, Nye County, Nevada (NNWSI project), 11:30748 (R;US)
Temperature Effects
Expected thermal and hydrothermal environments for waste emplacement holes based on G-tunnel heater experiments (NNWSI project), 11:30749 (R;US)
TUMORS
See NEOPLASMS
TUNDRA
Productivity
Potential responses of tundra ecosystems to perturbations from energy development. Part I. Annual report, 1983, 11:30591 (R;US)
TUNGSTEN
Emission Spectra
Effect of organic gases on molecular formation reactions in the DCP, 11:30238 (R;US)
Physical Radiation Effects
Advanced inboard shielding design for Tokamak fusion reactors, 11:31148 (J;US)
TUNGSTEN 166
High Spin States
Spectroscopy of ^{166}W and ^{167}W and alignment effects in very neutron-deficient tungsten nuclei, 11:30916 (R;AU)
TUNGSTEN 167
High Spin States
Spectroscopy of ^{166}W and ^{167}W and alignment effects in very neutron-deficient tungsten nuclei, 11:30916 (R;AU)
TUNGSTEN 178
Radioisotope Generators
Development of tungsten-tantalum generator. Final report, 11:30310 (R;US)
TUNGSTEN ALLOYS
See also ALLOY-CB-752
Physical Radiation Effects
Effects of irradiation on low activation ferritic alloys, 11:31062 (RA;US)
Tensile Properties
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)
TUNGSTEN CARBIDES
Absorption Spectroscopy
Determination of cobalt in samples containing cobalt and tungsten carbide by electrothermal atomic absorption spectrometry, 11:30548 (J;US)
TUNGSTEN COMPLEXES
Chemical Preparation
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
Crystal Structure
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
Molecular Structure
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
TUNGSTEN COMPOUNDS
See also TUNGSTEN CARBIDES

Chemical Reactions
Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_8(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_8$(M identical with M) and i-PrOH leading to $W_2(H)_2(O\text{-}i\text{-}Pr)_{14}$, 11:30210 (J;US)
Crystal Structure
Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_8(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_8$(M identical with M) and i-PrOH leading to $W_2(H)_2(O\text{-}i\text{-}Pr)_{14}$, 11:30210 (J;US)
Molecular Structure
Metal alkoxides - models for metal oxides. 9. Hydridoditungsten alkoxides: $W_2(H)(O\text{-}i\text{-}Pr)_8Na$ diglyme and $W_2(H)(I)(OCH_2\text{-}t\text{-}Bu)_8(H_2NMe)$. Further investigations of the reaction between $W_2(NMe_2)_8$(M identical with M) and i-PrOH leading to $W_2(H)_2(O\text{-}i\text{-}Pr)_{14}$, 11:30210 (J;US)

TUNISIA
Energy Policy
Tunisia - energy situation 1984/1985, 11:29930 (R;DE;In German)
Energy Supplies
Tunisia - energy situation 1984/1985, 11:29930 (R;DE;In German)

TURBINE BLADES
Aerodynamics
Aerofil characteristics of rotating blades, 11:29657 (RA;DE)
Calculation Methods
Development in aerodynamic calculation methods, 11:29655 (RA;DE)
Deposits
Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)
Design
Polar measurements on profiles, 11:29654 (RA;DE;In German)
Heat Resisting Alloys
High temperature oxidation and hot corrosion of nickel and cobalt based superalloys, 11:30102 (R;CA)
Testing
Aerofil characteristics of rotating blades, 11:29657 (RA;DE)
Polar measurements on profiles, 11:29654 (RA;DE;In German)

TURBINES
See also GAS TURBINES
STEAM TURBINES
WIND TURBINES
Design
Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)
Performance Testing
Design of a mixing system for simulated high-level nuclear waste melter feed slurries, 11:29410 (R;US)

TURBOJET ENGINES
Computerized Simulation
Simulating a small turboshaft engine in real-time multiprocessor simulator (RTMPS) environment, 11:30035 (R;US)

TURBULENCE
Mathematical Models
Modeling turbulent exchange in forest canopies, 11:30543 (RA;US)

TWO-PHASE FLOW
Mathematical Models
Single-substance, two-phase duct flow: a unified theoretical and experimental study, 11:30377 (R;US)
Research Programs
Single-substance, two-phase duct flow: a unified theoretical and experimental study, 11:30377 (R;US)

U

U3O8
See URANIUM OXIDES U3O8

UAR
See EGYPTIAN ARAB REPUBLIC

UCLBL
See LAWRENCE BERKELEY LABORATORY

UCLLL
See LAWRENCE LIVERMORE LABORATORY

UGANDA
Energy Supplies
Uganda - energy situation 1984, 11:29921 (R;DE;In German)

UINTA FORMATION
Geologic Surveys
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Hydrology
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Lithology
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)
Oil Shale Deposits
Detailed lithologic, rock quality, and hydrologic data from four drill holes in the Central Piceance Creek Basin, Rio Blanco County, Colorado, 11:29258 (BA;US)

UJM
See JET MODEL

ULTRACENTRIFUGE ENRICHMENT PLANTS
See CENTRIFUGE ENRICHMENT PLANTS

ULTRASONIC TESTING
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
Feasibility Studies
Ultrasonic inspection of partially completed welds using pattern recognition techniques, 11:30384 (R;US)

ULTRASONOGRAPHY
Biological Effects
Ultrasound: biological effects and industrial hygiene concerns, 11:30731 (J;US)

UMM AL QAIWAN
See UNITED ARAB EMIRATES

UNCORRELATED-JET MODEL
See JET MODEL

UNDERGROUND DISPOSAL
Comparative Evaluations
Comparison of land and ocean disposal alternatives for bulk wastes containing naturally occurring radionuclides, 11:29339 (RA;US)
Ground Subsidence
Subsidence and settlement and their effect on shallow land burial, 11:29326 (RA;US)
Performance
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Simulation
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)

UNDERGROUND GASIFICATION
See IN-SITU GASIFICATION

UNIFIED GAUGE MODELS
See also GRAND UNIFIED THEORY
Lectures
Particle physics and gauge theories, 11:30849 (R;FR)

UNION OF SOVIET SOCIALIST REPUBLICS
See USSR

UNITED ARAB EMIRATES
Energy Policy
United Arab Emirates - energy situation 1984, 11:29937 (R;DE;In German)
Energy Supplies
United Arab Emirates - energy situation 1984, 11:29937 (R;DE;In German)

UNITED ARAB REPUBLIC
See EGYPTIAN ARAB REPUBLIC

UNITED KINGDOM
Geothermal Exploration
Summary of the geothermal prospects for the United Kingdom. Final report of the British Geological Survey's Geomthermal Energy Programme 1979-1984, 11:29616 (R;GB)
Renewable Energy Sources
Prospects for the exploitation of the renewable energy technologies in the United Kingdom, 11:29916 (R;GB)
Service Sector
Energy use in the service sector in the United Kingdom, 11:29954 (RA;US)
Solar Space Heating
Active solar heating in the UK. Department of Energy R and D programme 1977-1984, 11:29566 (R;GB)
Solar Water Heating
Active solar heating in the UK. Department of Energy R and D programme 1977-1984, 11:29566 (R;GB)
Wave Power
Wave energy. The Department of Energy's R and D programme 1974-1983, 11:29643 (R;GB)
UNITED STATES OF AMERICA
See USA
UNIVAC COMPUTERS
Parallel Processing
Two parallel formulations of particle-in-cell models, 11:31291 (BA;US)
UNIVERSE
Infrared Spectra
Infrared observation of the early universe, 11:30776 (RA;JP)
UNIVERSITIES
See EDUCATIONAL FACILITIES
UNIVERSITY OF CALIFORNIA LAWRENCE RADIATI
See LAWRENCE BERKELEY LABORATORY
URANIUM
Adsorption
Interaction of groundwater and basalt fissure surfaces and its effect on the migration of actinides, 11:30586 (J;US)
Chemical Reaction Kinetics
Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid, 11:29424 (J;NL)
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Energy Levels
Wavelengths and energy levels of doubly ionized uranium (U III) obtained using a Fourier-transform spectrometer, 11:30321 (J;US)
Ion Exchange
Characterization and anion exchange removal of uranium from Hanford ground water, 11:30616 (R;US)
Ionization
Wavelengths and energy levels of doubly ionized uranium (U III) obtained using a Fourier-transform spectrometer, 11:30321 (J;US)
Isotope Ratio
Removal of isobaric interferences by resonance ionization mass spectrometry, 11:30188 (J;US)
Partition
Acid-split flowsheets for uranium-plutonium partitioning without a reductant, 11:29293 (R;US)
Personnel Monitoring
Results of incorporation monitoring by excretion analyses performed at the Karlsruhe Nuclear Research Center during the years 1979 until 1984, 11:30694 (R;DE;In German)
Quantitative Chemical Analysis
Use of arsenazo-III for the determination of uranium in phosphate materials. Study of interfering elements, 11:30180 (RA;BR;In Portuguese)
Radiochemistry
Characterization and anion exchange removal of uranium from Hanford ground water, 11:30616 (R;US)
Radiochemistry of uranium, neptunium and plutonium: an updating, 11:30311 (R;US)
Reduction
Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid, 11:29424 (J;NL)
Solvent Extraction
Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid, 11:29424 (J;NL)
URANIUM 232
Thermal Fission
Post-neutron mass distribution for ^{233}U(nsub(th),f), 11:30925 (R;FR)
Quasi-particle excitations in low energy fission, 11:30924 (R;FR)
URANIUM 233
Breeding Ratio
Nuclear performance optimization of the Be/Li/Th blanket for the fusion breeder, 11:31133 (J;US)
Fusion Yield
Design of a helium-cooled molten-salt fusion breeder, 11:31143 (J;US)
URANIUM 235
Laser Isotope Separation
Production of a Raman laser at 16 μm (For uranium enrichment by lasers), 11:29290 (R;FR;In French)
Thermal Fission
Cold fragmentation in thermal neutron induced fission of ^{235}U, 11:30926 (R;FR)
URANIUM 238 TARGET
Alpha Reactions
Excitation function and half-life for the fission isomer sup(240m) Pu from the ^{238}U(α, 2n) sup(240m) Pu reaction, 11:30928 (R;BR)
URANIUM ALLOYS
See also URANIUM BASE ALLOYS
Physical Radiation Effects
Gas-bubble growth mechanisms in the analysis of metal fuel swelling, 11:30082 (R;US)
URANIUM BASE ALLOYS
Hydridation
Study of the hydridation of an uranium alloy containing 0.2 weight percent of vanadium, 11:30073 (R;FR;In French)
Quenching
Computer simulation of quenching uranium-0.75% titanium penetrator blanks. Final report for FY 1984, 11:30106 (R;US)
URANIUM COMPLEXES
Chemical Preparation
Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$, 11:30317 (J;US)
Crystal Structure
Preparation of the first molecular carbon monoxide complex of uranium, $(Me_3SiC_5H_4)_3UCO$, 11:30317 (J;US)
URANIUM COMPOUNDS
Chemical Preparation
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Crystal Structure
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2CH_2PMe_2)$ and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)
Magnetic Susceptibility
Electronic structure of the uranium(IV)-tetrakis-1,1,1-trifluoro-4-phenylbutane-2,4-dionato: magnetochemical study, 11:30152 (R;FR;In French)
Molecular Structure
Preparation of tetraalkyl phosphine complexes of the f-block metals. Crystal structure of $Th(CH_2Ph)_4(Me_2PCH_2$

CH_2PMe_3) and $U(CH_2Ph)_3Me(Me_2PCH_2CH_2PMe_2)$, 11:30273 (J;US)

URANIUM DIOXIDE
Chemical Preparation
Study of reducing pyrohydrolysis of uranyl fluoride into uranium dioxide, 11:29291 (R;FR;In French)
Thermal Conductivity
Thermal conductivities for sintered and sphere-pac Li_2O and gamma-$LiAlO_2$ solid breeders with and without irradiation effects, 11:31255 (J;US)

URANIUM HEXAFLUORIDE
Cylinders
Thermal analysis of UF_6 cylinder inside a protective overpack, 11:30385 (R;US)
Dissociation
Single shot laser multiphoton ionization detection of UF_5 following the 266 nm photodissociation of UF_6, 11:30300 (J;CH)
Photochemistry
Single shot laser multiphoton ionization detection of UF_5 following the 266 nm photodissociation of UF_6, 11:30300 (J;CH)
Weight Measurement
Load-cell-based weighing system for weighing 9.1 and 12.7-tonne UF_6 cylinders, 11:29452 (R;US)

URANIUM ISOTOPES
See also URANIUM 232
URANIUM 233
URANIUM 235
Isotope Separation
Uranium enrichment by solvent extraction, 11:29289 (R;FR)

URANIUM OXIDES U3O8
Materials Recovery
Equilibrium and kinetic studies of the reductive stripping of uranium from DEPA-TOPO reagent into aqueous phosphoric acid, 11:29424 (J;NL)

URANIUM PENTAFLUORIDE
Detection
Single shot laser multiphoton ionization detection of UF_5 following the 266 nm photodissociation of UF_6, 11:30300 (J;CH)
Photoionization
Single shot laser multiphoton ionization detection of UF_5 following the 266 nm photodissociation of UF_6, 11:30300 (J;CH)

URANYL FLUORIDES
Reduction
Study of reducing pyrohydrolysis of uranyl fluoride into uranium dioxide, 11:29291 (R;FR;In French)

URANYL NITRATES
Photochemistry
Reduction of plutonium(IV) using photochemically generated uranium(IV), 11:30313 (R;US)
Subcriticality
Subcriticality measurements for two coupled uranyl nitrate solution tanks using ^{252}Cf-source-driven neutron noise analysis methods, 11:30335 (R;US)

URBAN AREAS
Acid Rain
Urban and local source effects on precipitation chemistry, 11:30552 (J;US)
Planning
Energy conservation and its implication for architectural design and town planning in the hot-arid areas of Saudi Arabia and the US Gulf States, 11:29589 (RA;US)

URUGUAY
Energy Policy
Uruguay - energy situation 1984, 11:29931 (R;DE;In German)
Energy Supplies
Uruguay - energy situation 1984, 11:29931 (R;DE;In German)

US DOE
See also ANL
BATTELLE PACIFIC NORTHWEST LABORATORIES
BNL
BONNEVILLE POWER ADMINISTRATION
FEED MATERIALS PRODUCTION CENTER
HANFORD RESERVATION
IDAHO NATIONAL ENGINEERING LABORATORY
LAWRENCE BERKELEY LABORATORY
LAWRENCE LIVERMORE LABORATORY
NEVADA TEST SITE
OAK RIDGE RESERVATION
ORNL
ROCKY FLATS PLANT
SANDIA LABORATORIES
SAVANNAH RIVER PLANT
SOLAR ENERGY RESEARCH INSTITUTE
WIPP
Budgets
Fiscal year 1986 DOE budget authorization: environmental research and development. Hearings before the Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science and Technology, US House of Representatives, Ninety-Ninth Congress, First Session, March 20, 26, 1985, No. 38, 11:30670 (B;US)
Contracts
General design of a technical assistance program to help DOE/prime contractor buyers in doing business with small disadvantaged businesses, 11:31272 (R;US)
Radioactive Waste Management
DOE approach to threshold quantities, 11:29332 (RA;US)
Strategy and need: DOE's hazardous waste program, 11:29333 (RA;US)
Research Programs
Development and application of tracers: examples of field and experimental studies, 11:29620 (RA;US)
Drilling technology/GDO, 11:29635 (RA;US)
Geosciences research in DOE - 1985, 11:29909 (RA;US)
Heat cycle research experimental program, FY-1985, 11:29913 (RA;US)
Overview geopressure program, 11:29914 (RA;US)
Overview of the US Department of Energy Geothermal program, 11:29908 (RA;US)
Overview on Cascades drilling status, 11:29619 (RA;US)
Programs of the Office of Energy Research, 11:30762 (R;US)
Research on geothermal chemistry and advanced instrumentation, 11:29628 (RA;US)
SAN overview/discussion of heat cycle research, 11:29982 (RA;US)
Scale control in geopressured energy production, 11:29636 (RA;US)
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Technology Transfer
Federal geothermal technology transfer activities, 11:29626 (RA;US)

US EPA
Environmental Policy
Hazardous waste. Federal agency hazardous waste disposal at Kettlemen Hills, California, 11:29936 (R;US)

US NRC
United States Nuclear Regulatory Commission-prior to 1975 was part of US AEC.
Inspection
Seismic and dynamic qualification of safety related electrical and mechanical equipment, 11:29850 (R;US)
Reactor Licensing
Intact decommissioning of nuclear power plants: a dose assessment, 11:29747 (R;US)
Regulations
Review of light water reactor regulatory requirements. Identification of regulatory requirements that may have marginal importance to risk. Volume 1, 11:29753 (R;US)
Regulatory Guides
Intact decommissioning of nuclear power plants: a dose assessment, 11:29747 (R;US)

USA
See also FEDERAL REGION I
FEDERAL REGION V
FEDERAL REGION VI
FEDERAL REGION VII
FEDERAL REGION X
GULF COAST
Commercial Sector
Electricity use in the US commercial sector 1960-2000, 11:29959 (RA;US)

Overview of electricity use in the United States service sector, 11:29960 (RA;US)
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Fuel Supplies
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Government Policies
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)
Petroleum Industry
Development of financial statements for the domestic petroleum industry, 1977, 11:29244 (R;US)
PWR Type Reactors
TRAC-PF1/MOD1 analysis of a 200% cold-leg break in a US/Japanese PWR with four loops and 15 x 15 fuel, 11:29845 (R;US)
Radioactive Waste Facilities
Operational experience of the Palisades volume reduction system: the first 12 months, 11:29387 (RA;US)
Seasonal Thermal Energy Storage
STES newsletter: a quarterly review of seasonal thermal energy storage, 11:29988 (J;US)
Service Sector
Models of the US service sector, 11:29971 (RA;US)

USSR
Exports
Coal: evolving supply and demand in world seaborne steam coal trade (1975 to 1985; forecasting to 1995), 11:29225 (R;US)

UTAH
Uranium Deposits
Structure and uranium deposits of the Salina Quadrangle, Utah, 11:29288 (R;US)

UTILITIES
See ELECTRIC UTILITIES
PUBLIC UTILITIES

V

VACUUM SYSTEMS
Design
Design of vacuum systems for MFTF-B neutral beamlines, 11:31205 (J;US)

VALINE
Metabolism
Quantitative studies in radiopharmaceutical science. Progress report, January 1-December 31, 1985, 11:30663 (R;US)

VALVES
Electroslag Casting
Fossil Energy Program. Quarterly progress report for the period ending December 31, 1985, 11:29152 (R;US)
Field Tests
Evaluation of the Motor-Operated Valve Analysis and Test System (MOVATS) to detect degradation, incorrect adjustments, and other abnormalities in motor-operated valves, 11:29802 (R;US)

VANADIUM
Physical Radiation Effects
Solute segregation and microstructural evolution in ion-irradiated vanadium-base alloys, 11:30084 (R;US)

VANADIUM ALLOYS
See also VANADIUM BASE ALLOYS
Hydridation
Advanced hydrogen storage: modified vanadium hydrides. Final report, 11:29459 (R;US)
Physical Radiation Effects
Effects of irradiation on low activation ferritic alloys, 11:31062 (RA;US)
Tensile Properties
Postirradiation tensile behavior of nickel-doped ferritic steels, 11:30080 (R;US)

VANADIUM BASE ALLOYS
See also VANSTAR 7
Corrosion
Environmental effects on the properties of vanadium-base alloys, 11:31041 (RA;US)
Embrittlement
Vanadium alloys for fusion reactor first wall application, 11:30089 (R;US)
Physical Radiation Effects
Effect of helium on the tensile properties of several vanadium alloys, 11:31058 (RA;US)
Effect of neutron irradiation on the tensile properties and microstructure of several vanadium alloys, 11:30085 (R;US)
FFTF fusion irradiations - FFTF cycles 4-6, 11:31045 (RA;US)
Radiation effects in vanadium alloys in fusion reactor environments, 11:31057 (RA;US)
Solute segregation and void formation in ion-irradiated vanadium-base alloys, 11:31056 (RA;US)
Solute segregation and microstructural evolution in ion-irradiated vanadium-base alloys, 11:30084 (R;US)
Tensile properties of helium-injected V-15Cr-5Ti after irradiation in EBR-II, 11:31059 (RA;US)
Vanadium alloy irradiation test matrix in FFTF, 11:31051 (RA;US)
Radioactivation
Vanadium alloys for fusion reactor first wall application, 11:30089 (R;US)
Swelling
Radiation effects in vanadium alloys in fusion reactor environments, 11:31057 (RA;US)

VANADIUM COMPLEXES
Chemical Preparation
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
Crystal Structure
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)
Molecular Structure
Study of sulfur ligand reactivity in dimeric dithiolate complexes of vanadium and tungsten, 11:30280 (J;US)

VANADIUM COMPOUNDS
See also VANADIUM OXIDES
Crystal-Phase Transformations
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Formation Free Energy
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Specific Heat
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)
Stability
Transformation characteristics of LaV/sub x/Nb/sub 1-x/O_4 compounds, 11:30138 (J;US)

VANADIUM MINERALS
See MINERALS

VANADIUM OXIDES
Crystal Structure
Partial structure-field map for $A^{3+}B^{5+}O_4$ compounds, 11:30135 (J;NL)

VANSTAR 7
Corrosion
Environmental effects on the properties of vanadium-base alloys, 11:31041 (RA;US)
Fatigue
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 11:30090 (R;US)
Physical Radiation Effects
Effect of neutron irradiation on the tensile properties and microstructure of several vanadium alloys, 11:30085 (R;US)
Thermal Cycling
In-vacuum cyclic fatigue behavior of Vanstar-7 at elevated temperatures, 11:30090 (R;US)

VAPOR CONDENSERS
Efficiency
Supercritical binary geothermal cycle experiments with mixed-hydrocarbon working fluids and a vertical, in-tube, counterflow condenser, 11:29629 (R;US)
VAPOR PRESSURE
Computer Codes
Revision of Primary Standards Laboratory's methods to calculate water vapor pressures, 11:31286 (R;US)
VAPORS
Deposition
Particle and vapor deposition in coal-fired gas turbines, 11:29669 (R;US)
VEGETATION
See PLANTS
VEHICLES
See also AUTOMOBILES
ELECTRIC-POWERED VEHICLES
TRUCKS
Design
Technological advances in vehicle design: Ford energy report, 11:30047 (B;GB)
Meetings
Technological advances in vehicle design: Ford energy report, 11:30047 (B;GB)
VELOCIMETERS
Construction
Measurement of the electrokinetic transport properties of particles in an electrostatic precipitator, 11:29744 (RA;US)
VENEZUELA
Climates
Use of geoclimatic data for the determination of building characteristics in the north of the Venezuelan Republic, 11:29598 (RA;US)
VENTILATION
Economics
Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study, 11:29999 (R;FI;In Finnish)
Energy Conservation
Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study, 11:29999 (R;FI;In Finnish)
VENTILATION DUCTS
See DUCTS
VENTILATION
VENTILATION SYSTEMS
Design
Possibilities of developing the energy-effiency of ventilation systems, equipment and components. A pilot study, 11:29999 (R;FI;In Finnish)
VERSENE
See EDTA
VERTICAL AXIS TURBINES
Aerodynamics
Aeroelastic effects in the structural dynamic analysis of vertical axis wind turbines, 11:29664 (R;US)
VESSELS
See CONTAINERS
VESSELS (CHEMICAL REACTIONS)
See CHEMICAL REACTORS
VESSELS (PRESSURE)
See PRESSURE VESSELS
VIBRATIONAL BAND
See VIBRATIONAL STATES
VIBRATIONAL STATES
Frequency Measurement
Frequency shift measurement in shock-compressed materials, 11:30516 (P;US)
VIBRATIONS (MECHANICAL)
See MECHANICAL VIBRATIONS
VIET NAM
Biomass Conversion Plants
Possibilities and limits of community biogas plants in the frame work of biogas propagation strategy in Viet Nam, 11:29477 (RA;DE)
Government Policies
Possibilities and limits of community biogas plants in the frame work of biogas propagation strategy in Viet Nam, 11:29477 (RA;DE)
VILLIGEN CYCLOTRON
See SIN CYCLOTRON
VINYL MONOMERS
Pyrolysis
Formation of benzene by the pyrolysis of 4-vinylcyclohexene regiospecific formation of anthracenes in the pyrolysis of dibenzosuberones and related systems, 11:30271 (D;US)
VISCOUS FLOW
Computer Codes
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
Three-Dimensional Calculations
TRIO a general computer code for reactor 3-D flows analysis. Application to a LMFBR hot plenum, 11:30376 (R;FR)
VISIBLE RADIATION
Biological Effects
Influence of shade on the growth and nitrogen assimilation of developing fruits on bell pepper, 11:30656 (J;US)
Health Hazards
Memorandum - optical radiation danger when using RSV, 11:30730 (TG;US)
VISIBLE SPECTRA
Pressure Dependence
High-pressure study of triphenylmethane dyes in polymeric and aqueous media, 11:30249 (J;US)
VISITOR CENTERS
See PUBLIC BUILDINGS
VITRINITE
See MACERALS
VOLTAGE
See ELECTRIC POTENTIAL
VOLTAIC CELLS
See ELECTRIC BATTERIES

W

WALLS
Geometry
Effect of wall geometry on net heat gain or loss, 11:30009 (RA;US)
WASHINGTON
Radioactive Waste Facilities
Through the regulatory hoop, 11:29322 (RA;US)
WASTE BURIAL
See UNDERGROUND DISPOSAL
WASTE CHEMICALS
See CHEMICAL WASTES
WASTE FORMS
Extended storage of low-level radioactive waste: potential problem areas, 11:30079 (RA;US)
Compression Strength
Stabilizing solidification I: a method of immobilization of radioactive waste involving volume reduction, 11:29345 (RA;US)
Density
Stabilizing solidification I: a method of immobilization of radioactive waste involving volume reduction, 11:29345 (RA;US)
Leaching
Hydrothermal flow-through apparatus to simulate leaching of nuclear waste forms under quasi-dynamic conditions, 11:29431 (R;CA)
Scientific basis for nuclear waste management IX, 11:29420 (B;US)
Stabilizing solidification I: a method of immobilization of radioactive waste involving volume reduction, 11:29345 (RA;US)
Transport of nitrate from a large cement based waste form (Saltstone), 11:29436 (R;US)

Performance
Fuel characterization research for the Canadian Nuclear Fuel Waste Management Program, 11:29315 (R;CA)
Specifications
Preliminary Hanford Waste Vitrification Plant waste form qualification plan, 11:29416 (R;US)
WASTE ISOLATION PILOT PLANT
See WIPP
WASTE MANAGEMENT
See also RADIOACTIVE WASTE MANAGEMENT
WASTE TRANSPORTATION
Remedial Action
Framework for resolving hazardous waste cleanup liability, 11:30593 (RA;US)
WASTE SOLUTIONS
See LIQUID WASTES
WASTE TRANSPORTATION
Computerized Simulation
U.S. Department of Energy transportation programs: computerized techniques, 11:29308 (BA;US)
Remote Handling Equipment
Use of remote systems and automation in radioactive waste shipping and receiving, 11:29306 (R;US)
WASTE WATER
Anaerobic Digestion
Anaerobic digestion of slaughter waste water, 11:29469 (RA;DE)
Isotope Ratio
The determination of deuterium and tritium in effluent wastewater by pulsed nuclear magnetic resonance spectroscopy, 11:31101 (J;US)
Purification
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
Waste Disposal
The effect of residual carbon on adsorption of organic compounds by retorted oil shale, 11:29285 (BA;US)
Water Treatment
Process for removal of ammonia and acid gases from contaminated waters, 11:30031 (P;US)
WASTEFORMS
See WASTE FORMS
WATER
See also DRINKING WATER
FEEDWATER
GROUND WATER
SEAWATER
WASTE WATER
Convection
Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
Corrosive Effects
Environmental effects on the properties of vanadium-base alloys, 11:31041 (RA;US)
Decomposition
Reduction of carbon dioxide by tris(2,2'-bipyridine) cobalt(I), 11:30225 (J;NL)
Diffusion
Experimental test of McDougall's theory for the onset of convective instabilities in isothermal ternary systems, 11:30200 (J;US)
Pumping
Biogas technology for water pumping in Botswana, 11:29464 (RA;DE)
Solvent Properties
Small-angle neutron-scattering study of alkyl polyoxyethylene sulfate micelles. Effect of the number of polyoxyethylene groups on n-dodecyl polyoxyethylene sulfate in D_2O/H_2O mixtures at 25°C, 11:30263 (J;US)
Thermodynamic Properties
Large-scale fluctuations and the critical behavior of dilute NaCl in H_2O, 11:30197 (J;US)
WATER COOLANT
See WATER
WATER MODERATOR
See WATER
WATER POLLUTION
Meetings
Perspectives on nonpoint source pollution - proceedings of a national conference, 11:29188 (R;US)
WATER QUALITY
Cost
Effect of distance on the preservation value of water quality, 11:29907 (J;US)
Monitoring
Great Plains coal gasification project. Quarterly technical progress report, first quarter 1986, 11:29198 (R;US)
WATER RESOURCES
Consumption Rates
Estimated use of water in the US in 1980, 11:30603 (R;US)
WATER SOURCE HEAT PUMPS
Refrigerants
Vertical recirculation-type evaporators. An investigation of heat transfer and refrigerant circulation, 11:29989 (R;SE;In Swedish)
WATER TABLES
Kriging
Geostatistical analysis of potentiometric data in Wolfcamp aquifer of the Palo Duro Basin, Texas, 11:30739 (R;US)
WATERBORNE PARTICLES
See PARTICULATES
WATERFLOODING
Comparative Evaluations
Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)
Field Tests
Evaluation of the Little Knife CO_2 minitest, 11:29233 (R;US)
WATERSHEDS
Nutrients
Potential responses of tundra ecosystems to perturbations from energy development. Part I. Annual report, 1983, 11:30591 (R;US)
Runoff
Potential responses of tundra ecosystems to perturbations from energy development. Part I. Annual report, 1983, 11:30591 (R;US)
WAVE POWER
Appraisal
Wave energy. The Department of Energy's R and D programme 1974-1983, 11:29643 (R;GB)
WAVE PROPAGATION
Computerized Simulation
EURDYN-1D: a computer code for the one-dimensional non-linear dynamic analysis of structural systems. Description and users' manual (release 1) (Reactor structures), 11:31279 (R;FR)
WAVEGUIDES
ICRF heating technology development activities at Oak Ridge National Laboratory, 11:31026 (R;US)
Performance
Folded waveguide cavity coupler for ICRF heating, 11:31027 (R;US)
WAZ 16
See NICKEL BASE ALLOYS
WEAK HADRONIC DECAY
Bag Model
Non-leptonic hyperon decays in the chiral bag model, 11:30865 (R;FR)
WECS
See WIND TURBINES
WEIGHT INDICATORS
Load-cell-based weighing system for weighing 9.1 and 12.7-tonne UF_6 cylinders, 11:29452 (R;US)
Calibration
Tennessee Valley Authority coal inventory procedures and observations, 11:29682 (R;US)
WELDED JOINTS
Crack Propagation
Study of crack inititation and propagation in heterogeneous welded joints, 11:30074 (R;FR;In French)
Heat Affected Zone
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)

Residual Stresses
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
WELDING
See also ELECTRON BEAM WELDING
RESISTANCE WELDING
Transformers
400 Hz welding transformer gun assembly evaluation. Final report, 11:30394 (R;US)
Ultrasonic Testing
Ultrasonic inspection of partially completed welds using pattern recognition techniques, 11:30384 (R;US)
WELDS
See WELDED JOINTS
WELL CASINGS
Corrosion
Use of an acoustic borehole televiewer to investigate casing corrosion in geothermal wells, 11:29623 (R;US)
WELL DRILLING
Research Programs
Drilling technology/GDO, 11:29635 (RA;US)
WELL LOGGING EQUIPMENT
To be used only when the equipment itself is the topic of the paper; includes source, detector, and associated equipment.
Design
Convective heat flow probe, 11:29624 (P;US)
Evaluation and design of a large spacing loop-loop electromagnetic tool, 11:30354 (R;US)
Electromagnets
Evaluation and design of a large spacing loop-loop electromagnetic tool, 11:30354 (R;US)
Well Logging
Method for isolating two aquifers in a single borehole, 11:30405 (P;US)
WEST GERMANY
See FEDERAL REPUBLIC OF GERMANY
WETLANDS
Aerial Surveying
Variation of bulk density in Swedish peat bogs, 11:29203 (R;SE;In Swedish)
Ecology
Division of Wetlands Ecology FY-1985 highlights, 11:30569 (RA;US)
WHISKERS
Tensile Properties
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
WILD ANIMALS
Ecology
Division of Stress and Wildlife Ecology FY-1985 highlights, 11:30570 (RA;US)
WIND
Velocity
Evaluation of chemical stabilizers and windscreens for wind erosion control of uranium mill tailings, 11:30557 (RA;US)
WIND ENERGY CONVERSION SYSTEMS
See WIND TURBINES
WIND GENERATORS
See WIND TURBINES
WIND POWER PLANTS
Control Systems
Resonance compensation of wind power plants with variable rotor speed, 11:29668 (R;SE;In Swedish)
Economics
Generic wind studies in the DEn programme, 11:29647 (RA;GB)
WIND TURBINES
See also VERTICAL AXIS TURBINES
Aerodynamics
Aerodynamic theory in the calculation of the GROWIAN rotor compared with some experimental data, 11:29659 (RA;DE)
Aerodynamic research on wind turbines at NLR, 11:29661 (RA;DE)
Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats, 11:29662 (RA;DE)
Implementing agreement for co-operation in the development of large scale wind energy conversion systems, 11:29653 (R;DE)
Unsteady aerodynamics applied to the horizontal axis wind turbine disk, 11:29658 (RA;DE)
Calculation Methods
Aerodynamic theory in the calculation of the GROWIAN rotor compared with some experimental data, 11:29659 (RA;DE)
Aerodynamic research on wind turbines at NLR, 11:29661 (RA;DE)
Implementing agreement for co-operation in the development of large scale wind energy conversion systems, 11:29653 (R;DE)
Unsteady aerodynamics applied to the horizontal axis wind turbine disk, 11:29658 (RA;DE)
Composite Materials
Manufacturing of blades WTS 1200 (Manufacturing of blades for the wind power plant WTS 1200), 11:29666 (R;SE;In Swedish)
Dynamic Loads
Full-scale experiments at Maglarp. Sub-project: Loads and strains. Sub-report nr 2: Valuation of measurements during October and November 1983, 11:29665 (R;SE;In Swedish)
Economics
R and D needs in wind energy - the manufacturers view, 11:29645 (RA;GB)
Environmental Effects
Measurements of TV-interference from the wind power plant at Maglarp, 11:29644 (R;SE;In Swedish)
Maintenance
Full-scale experiments at Maglarp. Final report, 11:29667 (R;SE;In Swedish)
Manufacturing
Manufacturing of blades WTS 1200 (Manufacturing of blades for the wind power plant WTS 1200), 11:29666 (R;SE;In Swedish)
Operation
Full-scale experiments at Maglarp. Final report, 11:29667 (R;SE;In Swedish)
Research Programs
Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats, 11:29662 (RA;DE)
Strains
Full-scale experiments at Maglarp. Sub-project: Loads and strains. Sub-report nr 2: Valuation of measurements during October and November 1983, 11:29665 (R;SE;In Swedish)
Stresses
Full-scale experiments at Maglarp. Sub-project: Loads and strains. Sub-report nr 2: Valuation of measurements during October and November 1983, 11:29665 (R;SE;In Swedish)
WINDOWS
Heat Transfer
Detailed thermal performance data on conventional and highly insulating window systems, 11:30003 (R;US)
Thermal Efficiency
Detailed thermal performance data on conventional and highly insulating window systems, 11:30003 (R;US)
WIPP
Hydrology
Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
Lithology
Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
Stratigraphy
Rustler Formation as a transport medium for contaminated groundwater, 11:30740 (R;US)
WOLFRAM
See TUNGSTEN
WOOD
Combustion
Wood fuels properties and principles of pricing, 11:29490 (R;FI;In Finnish)

Harvesting
Utilization of chipwood in Lapland. Prehandling, 11:29491 (R;FI;In Finnish)
Wood fuels properties and principles of pricing, 11:29490 (R;FI;In Finnish)
Materials Handling
Utilization of chipwood in Lapland. Prehandling, 11:29491 (R;FI;In Finnish)
Moisture
Wood fuels properties and principles of pricing, 11:29490 (R;FI;In Finnish)

WOOD ALCOHOL
See METHANOL

WOOD FUELS
Use of this term is limited to policy, feasibility, and socio-economic studies. For wood properties use WOOD.
Prices
Wood fuels properties and principles of pricing, 11:29490 (R;FI;In Finnish)

WOOD PRODUCTS INDUSTRY
See also PAPER INDUSTRY
Sludges
Possibilities of using sludge for energy purposes, 11:30027 (R;FI;In Finnish)
Spent Liquors
Physical properties of spent liquor from chemical pulping processes, 11:30028 (R;FI;In Finnish)
Waste Heat Utilization
Possibilities of using sludge for energy purposes, 11:30027 (R;FI;In Finnish)

WOOD WASTES
Pyrolysis
Biomass thermochemical conversion program. 1985 annual report, 11:29486 (R;US)

WORKERS
See PERSONNEL

WORLD
See EARTH PLANET

X

X RADIATION
Absorption Spectra
Method and apparatus for molecular imaging using x-rays at resonance wavelengths, 11:30503 (P;US)
Chemical Radiation Effects
Structure of the σ^* radical anion in irradiated iodoacetamide, 11:30307 (J;GB)
Scattering
Method and apparatus for molecular imaging using x-rays at resonance wavelengths, 11:30503 (P;US)

XENOBIOTICS
Toxicity
Cytotoxicity from coupled redox cycling of autoxidizing xenobiotics and metals: a selective critical review and commentary on work-in-progress, 11:30727 (J;IL)

XENON
Autoionization
High resolution laser spectroscopy of Xe(5p6 to 5p5 11s-prime) at 94.2 nm, 11:30375 (BA;US)
Laser Spectroscopy
High resolution laser spectroscopy of Xe(5p6 to 5p5 11s-prime) at 94.2 nm, 11:30375 (BA;US)
Photoionization
High resolution laser spectroscopy of Xe(5p6 to 5p5 11s-prime) at 94.2 nm, 11:30375 (BA;US)
Radiolysis
Excitation of aromatic hydrocarbons in electron beam irradiated rare gas-hydrocarbon mixtures, 11:30250 (J;US)

XENON COMPOUNDS
Photoionization
Predissociation and ionization of excited KrXe observed using resonantly enhanced multiphoton ionization-photoelectron spectroscopy, 11:30293 (J;NL)

XENON IONS
Energy-Level Transitions
Identification of highly-ionized xenon spectra (Xe XXVI through Xe XXXI) excited in the plasma of the TFR Tokamak, 11:30966 (R;FR)

X-RASERS
See X-RAY LASERS

X-RAY DETECTION
Multiwire Proportional Chambers
X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 11:30422 (R;US)
Position Sensitive Detectors
X-ray position detection in the region of 6 μm RMS with wire proportional chambers, 11:30422 (R;US)

X-RAY EQUIPMENT
See also X-RAY SOURCES
HgI2 Semiconductor Detectors
Mercuric iodide X-ray camera, 11:30667 (J;US)
Performance
Mercuric iodide X-ray camera, 11:30667 (J;US)
Physical Radiation Effects
Shielding analysis for the horizontal x-ray imaging system on the TFTR, 11:31001 (J;US)
Shielding
Shielding analysis for the horizontal x-ray imaging system on the TFTR, 11:31001 (J;US)

X-RAY LASERS
Model for electron cooling by radiation losses in plasmas: application to soft x-ray laser development, 11:31078 (R;US)
Gain
Possibilities for achieving x-ray lasing action by use of high-order multiphoton processes, 11:30365 (J;US)
Multi-Photon Processes
Possibilities for achieving x-ray lasing action by use of high-order multiphoton processes, 11:30365 (J;US)
Optical Pumping
Possibilities for achieving x-ray lasing action by use of high-order multiphoton processes, 11:30365 (J;US)

X-RAY SOURCES
For cosmic sources of x radiation use COSMIC X-RAY SOURCES.
Computer-Aided Design
Soft X-ray source based on a low divergence, high repetition rate ultraviolet laser, 11:30371 (BA;US)
Design
Method and apparatus for molecular imaging using x-rays at resonance wavelengths, 11:30503 (P;US)

XUV
See EXTREME ULTRAVIOLET RADIATION

XYLENES
Chemical Reaction Kinetics
Kinetic study of reactions important in aromatic hydrocarbon combustion. Final report, August 1, 1982-July 31, 1985, 11:30234 (R;US)

Y

YANG-MILLS THEORY
Gauge theories in loop space, 11:30885 (R;GB)

YELLOW CAKE
See URANIUM OXIDES U3O8

YOLK
See EGGS

YTTERBIUM ALLOYS
Valence
Bulk and surface valence of $YbBe_{13}$, 11:30111 (J;CH)

YTTRIUM 88
Diffusion
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)

YTTRIUM 89 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Oxygen 16 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
YTTRIUM ALUMINIUM GARNETS
See ALUMINIUM OXIDES
YUCCA MOUNTAIN
Hydrology
Fluid flow in a fractured rock mass (NNWSI Project), 11:30742 (R;US)
Tuff
Fluid flow in a fractured rock mass (NNWSI Project), 11:30742 (R;US)

Z

ZEA MAYS
See MAIZE
ZINC
Diffusion
Predictive geochemical modeling of contaminant concentrations in laboratory columns and in plumes migrating from uranium mill tailings waste impoundments, 11:29441 (R;US)
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
Ecological Concentration
Collection and analysis of trace metals in continental precipitation at forested sites in the Southeastern United States, 11:30524 (R;US)
Uptake
Effects of diethyldithiocarbamate and nickel chloride on glutathione and trace metal concentrations in rat liver, 11:30729 (J;NL)
ZINC 64 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
Neon 20 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
ZINC 66 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
ZINC 68 TARGET
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
ZINC BROMIDES
Thermodynamic Properties
Thermodynamic properties state equations of pure methanol and methanol-LiBr . $ZnBr_2$ solutions used in vapor absorption refrigeration and air-conditioning cycle, 11:29595 (RA;US)
ZINC COMPOUNDS
See also ZINC OXIDES
Polymerization
Raman spectroscopy of polymers of metal protoporphyrin free acids on metal electrodes, 11:30283 (J;US)
ZINC ISOTOPES
Carbon 12 Reactions
Direct measurement of reaction total cross sections for heavy ion collisions in the energy range from 30 to 300 MeV/nucleon, 11:30898 (R;FR;In French)
ZINC OXIDES
Surface Area
Surface chemistry of mineral powders. I. Rapid determination of low surface areas of mineral powders by adsorption calorimetry, 11:29312 (R;CA)
ZINC-BROMINE BATTERIES
Design
Circulating electrolyte zinc/bromine battery test program and procedures, 11:29888 (RA;US)
Performance Testing
Circulating electrolyte zinc/bromine battery test program and procedures, 11:29888 (RA;US)
Flowing electrolyte batteries test methods and results, 11:29887 (RA;US)
Overview of rechargeable battery testing in Japan, 11:29883 (RA;US)
ZINC-CHLORINE BATTERIES
Performance Testing
Overview of rechargeable battery testing in Japan, 11:29883 (RA;US)
ZIRCALOY
For unspecified Zircaloy alloys.
Corrosion
High resolution in situ ultrasonic corrosion monitor, 11:29807 (P;US)
Embrittlement
Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)
Laser Welding
Welding of sule elements for nuclear reactors with solid state YAG laser using instrumentated testing equipments, 11:30075 (R;FR;In French)
Materials Testing
Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)
Oxidation
Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)
Reactor Materials
Assessment of safety margins in zircaloy oxidation and embrittlement criteria for ECCS acceptance, 11:29857 (R;US)
Rewetting
Analysis of zircaloy rewetting experiments and their implication for reactor fuel, 11:29838 (R;FR)
ZIRCONATES
Specific compounds should be indexed by coordination of a descriptor of the form (CATION) COMPOUNDS and the above anion descriptor.
Raman Spectra
Raman spectroscopic investigation of alkali-metal hexachloro compounds of refractory metals, 11:30217 (J;US)
ZIRCONIUM
Distribution Functions
Soil nuclide distribution coefficients and their statistical distributions, 11:29430 (R;CA)
ZIRCONIUM 95
Diffusion
Cation impurity diffusion in CoO and NiO, 11:30232 (J;GB)
ZIRCONIUM BASE ALLOYS
See also ZIRCALOY
Creep
Verification tests of a high-temperature transverse creep model for Zr-2.5 wt % Nb pressure tubes, 11:30070 (R;CA)
Phase Transformations
Model for growth of beta-phase particles in zirconium-2.5 wt% niobium, 11:30119 (R;CA)

ZIRCONIUM OXIDES
Adsorption
Ion-exchange properties of activated carbon filled with hydrous Zr(IV) and Zr(IV)-P(V) oxides, 11:30174 (J;NL)
Crack Propagation
Subcritical crack growth in partially stabilized ZrO_2(MgO), 11:30125 (J;GB)
Fracture Properties
Fracture toughness of $MgCr_2O_4$-ZrO_2 composities, 11:30133 (BA;US)
Phase Diagrams
Fossil Energy Materials Program. Quarterly progress report for the period ending December 31, 1985, 11:29167 (R;US)
ZIRCONIUM PHOSPHATES
Adsorption
Ion-exchange properties of activated carbon filled with hydrous Zr(IV) and Zr(IV)-P(V) oxides, 11:30174 (J;NL)
ZPPR REACTOR
Control Elements
Measurements of $^{10}B(n,He)$ reaction rates in a mockup control rod in ZPPR, 11:29777 (R;US)
ZT-40 DEVICES
Particle Losses
Invited paper: measurements and model of the coupled particle loss and fluid acceleration in the boundary layer of the zt-40m reversed-field pinch, 11:31262 (BA;US)
Plasma Acceleration
Invited paper: measurements and model of the coupled particle loss and fluid acceleration in the boundary layer of the zt-40m reversed-field pinch, 11:31262 (BA;US)
Research Programs
Status of the ZT-40M RFP experimental program, 11:31177 (J;US)

CONTRACT NUMBER INDEX

Numbers assigned to DOE contracts under which documents announced in this publication were prepared are included in this index.

Contract No.	*Abstract No.*	*Report No.*
AA03-76SF00034	**University of California School of Engineering and Applied Science, Department of Mechanical, Aerosp**	
	11:31087	Fusion Technology 9 NO. 2. vp (Mar 1986).
AC01-78EI06320	**Energy and Environmental Analysis, Inc., Arlington, VA (USA)**	
	11:29946	DOE/EI/06320—T2
	11:29947	DOE/EI/06320—T3-Vol.1
	11:29948	DOE/EI/06320—T3-Vol.3
	11:29979	DOE/EI/06320—T3-Vol.2-Pt.1
	11:29980	DOE/EI/06320—T3-Vol.2-Pt.2
AC01-79EI10464	**ICF, Inc., Washington, DC (USA)**	
	11:29244	DOE/EI/10464—T2
AC01-80MI01005	**Ronson Management Corp., Alexandria, VA (USA)**	
	11:29941	DOE/MI/01005—T1-Exec.Summ.
AC01-81RA50179	**ICF, Inc., Washington, DC (USA)**	
	11:29228	DOE/RA/50179—T1
AC01-84ER80108	**Memory Metals, Inc., Stamford, CT (USA)**	
	11:29637	DOE/ER/80108—T1
AC01-84RW00034	**NUS Corp., Gaithersburg, MD (USA)**	
	11:29301	NUS—4724
AC02-76CH00016	**Arizona Univ., Tucson (USA). Coll. of Engineering**	
	11:29433	CONF-850314—Vol.2(1985).
	Oak Ridge Gaseous Diffusion Plant, TN (USA)	
	11:29452	BNL—37685
	Allied Corp., Morristown, NJ (USA). Corporate Technology	
	11:29459	BNL—37866
	Brookhaven National Lab., Upton, NY (USA)	
	11:29783	BNL—37407
	11:29784	BNL—37931
	11:29793	BNL-NUREG—37617
	11:29803	NUREG/CR—4557
	11:29824	BNL—37930
	11:29825	BNL-NUREG—37612
	11:29826	BNL-NUREG—37615
	11:29827	BNL-NUREG—37616
	11:29828	BNL-NUREG—37705
	11:29829	BNL-NUREG—37869
	11:29830	BNL-NUREG—37940
	11:29850	NUREG/CR—3137
	London School of Economics and Political Science (UK). Dept. of Social Psychology	
	11:29853	NUREG/CR—4016-Vol.1
	Arizona Univ., Tucson (USA). Coll. of Engineering	
	11:30079	CONF-850314—Vol.2(1985).
	11:30202	Journal of Physical Chemistry 90 NO. 7. 1445-1448 (27 Mar 1986).
	11:30209	Journal of Physical Chemistry 90 NO. 3. 497-500 (30 Jan 1986).
	11:30225	Coordination Chemistry Reviews 64 247-260 (1985).
	11:30256	Journal of Physical Chemistry 90 NO. 1. 152-156 (2 Jan 1986).
	11:30287	Journal of Physical Chemistry 90 NO. 3. 491-497 (30 Jan 1986).
	11:30292	Inorganic Chemistry 24 NO. 23. 3743-3749 (6 Nov 1985).
	11:30303	Inorganic Chemistry 24 NO. 23. 3895-3898 (6 Nov 1985).
	Brookhaven National Lab., Upton, NY (USA)	
	11:30361	BNL—37898
	11:30392	BNL—37844
	11:30415	BNL—37817
	11:30422	BNL—37948
	11:30423	BNL—37899
	11:30459	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30521	Journal of Climate and Applied Meteorology 23 NO. 6. 967-978 (Jun 1984).
	11:30548	American Industrial Hygiene Association Journal 46 NO. 9. 476-480 (Sep 1985).
	11:30552	Proceedings, Annual Meeting, Air Pollution Control Association 2 21 (1984).
	11:30553	Proceedings, Annual Meeting, Air Pollution Control Association 2 31 (1984).
	11:30608	BNL—37768
	11:30613	Special Symposia - American Society of Limnology and Oceanography 632-651 (1976).
	11:30625	Journal of the American Chemical Society 108 NO. 2. 323-325 (22 Jan 1986).
	11:30637	Photochemistry and Photobiology 41 NO. 3. 303-307 (1985).
	11:30658	BNL—37836
	11:30952	BNL—37962
	Army Armament Research and Development Command, Dover, NJ (USA)	
	11:30955	BNL—37891
	Brookhaven National Lab., Upton, NY (USA)	
	11:30960	BNL—37846
AC02-76CH03000	**Fermi National Accelerator Lab., Batavia, IL (USA)**	
	11:30412	FNAL/C—86/30
	Chicago Univ., IL (USA). Enrico Fermi Inst.	
	11:30763	FNAL/Pub—86/36-A
	Fermi National Accelerator Lab., Batavia, IL (USA)	
	11:30764	FNAL/Pub—86/47-A
	11:30765	FNAL/Pub—86/48-A
	11:30766	FNAL/Pub—86/49-A
	11:30767	FNAL/Pub—86/57-A
	Chicago Univ., IL (USA). Enrico Fermi Inst.	
	11:30880	FNAL/Pub—86/38-A
AC02-76CH03073	**Princeton Univ., NJ (USA). Plasma Physics Lab.**	
	11:30978	PPPL—2268
	11:30979	PPPL—2272
	11:30980	PPPL—2284
	11:30981	PPPL—2314

Contract No.	Abstract No.	Report No.
	11:31078	PPPL—2270
	11:31079	PPPL—2320
AC02-76ER01198	**University of Illinois at Urbana-Champaign, 1101 West Springfield Avenue, Urbana, Illinois 61801**	
	11:30165	Applied Physics Letters 48 NO. 18. 1223-1225 (5 May 1986).
	11:30249	Journal of Physical Chemistry 90 NO. 4. 589-592 (13 Feb 1986).
AC02-76ER01338	**Michigan State Univ., East Lansing**	
	11:30627	Plant Physiology 79 NO. 1. 11-17 (Sep 1985).
	11:30630	Plant Physiology 78 NO. 4. 853-858 (Aug 1985).
	11:30676	Plant Physiology 79 NO. 1. 194-198 (Sep 1985).
	11:30678	Plant Physiology 78 NO. 3. 623-626 (Jul 1985).
	11:30682	Plant Physiology 77 NO. 1. 25-28 (Jan 1985).
	11:30683	Plant Physiology 77 NO. 1. 248-251 (Jan 1985).
AC02-76ER02026	**Univ. of Minnesota, Minneapolis**	
	11:30286	Journal of Physical Chemistry 90 NO. 4. 607-614 (13 Feb 1986).
AC02-76ER02190	**Univ. of Utah, Salt Lake City**	
	11:30214	Journal of Physical Chemistry 89 NO. 26. 5840-5845 (19 Dec 1985).
AC02-76ER02289	**Dept. of Physics and Astronomy, Northwestern Univ., Evanston, IL 60201**	
	11:30458	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
AC02-76ER02542	**Princeton Univ., NJ (USA). Dept. of Chemistry**	
	11:30194	DOE/ER/02542—4
AC02-76ER02944	**Wright State Univ., Dayton, OH (USA)**	
	11:30322	DOE/ER/02944—9
AC02-76ER03069	**Massachusetts Institute of Technology, Cambridge, MA 02139**	
	11:30477	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
AC02-76ER03075	**Gibbs Lab., Yale Univ., New Haven, CT 06511**	
	11:30436	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
AC02-76ER03231	**Brandeis Univ., Waltham, MA**	
	11:30653	Plant Physiology 77 NO. 2. 509-511 (Feb 1985).
AC02-76ER03244	**Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Physics**	
	11:30896	DOE/ER/03244—121
AC02-76EV01199	**Illinois Dept. of Energy and Natural Resources, Champaign, IL**	
	11:30550	Proceedings, Annual Meeting, Air Pollution Control Association 2 21 (1984).
AC02-76EV01340	**Colorado State Univ., Fort Collins**	
	11:30522	Monthly Weather Review 112 NO. 4. 617-637 (Apr 1984).
AC02-76EV03140	**Univ. of Connecticut, Farmington**	
	11:30729	Toxicology 1-6 ([1986]).
AC02-77CH00178	**Solar Energy Research Institute, Golden, Colorado 80401**	
	11:30169	Physical Review Letters 56 NO. 13. 1400-1403 (31 Mar 1986).
AC02-77ER04392	**Woods Hole Oceanographic Institution, MA (USA)**	
	11:29231	DOE/ER/04392—8
AC02-77EV04268	**Sloan-Kettering Inst. for Cancer Research, New York (USA). Biophysics Lab.**	
	11:30662	DOE/EV/04268—T5
AC02-78ER04940	**Columbia Univ., New York, NY**	
	11:30290	Journal of Physical Chemistry 90 NO. 1. 83-87 (2 Jan 1986).
AC02-78EV04969	**Lab. for Nuclear Science, MIT, Cambridge, MA 02139**	
	11:30666	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
AC02-80ER10689	**Purdue Univ., Lafayette, IN (USA). Dept. of Chemistry**	
	11:30235	DOE/ER/10689—6
AC02-80ER10746	**Univ. of Arizona, Tucson**	
	11:30266	Inorganic Chemistry 24 NO. 23. 3835-3841 (6 Nov 1985).
AC02-80ET34072	**Science Applications International Corp., Los Altos, CA (USA)**	
	11:29749	DOE/ET/34072—4-Draft
AC02-80EV10359	**Franklin McLean Memorial Research Inst., Chicago, IL (USA)**	
	11:30663	DOE/EV/10359—T1
AC02-81ER10872	**Cornell Univ., Ithaca, NY**	
	11:29487	Archives of Microbiology 138 263-272 (1984).
AC02-81ER10899	**Univ. of Missouri, Columbia**	
	11:30671	Plant Physiology 79 NO. 1. 290-295 (Sep 1985).
AC02-81ER10902	**Univ. of Nebraska, Lincoln**	
	11:30633	Plant Physiology 77 NO. 3. 578-583 (Mar 1985).
AC02-81ER10980	**Northwestern Univ., Evanston, IL (USA). Dept. of Chemistry**	
	11:30195	DOE/ER/10980—4
AC02-82CE40543	**Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.**	
	11:29215	DOE/CE/40543—1
	11:29216	DOE/CE/40543—6
AC02-82CH10088	**Fluor Technology, Inc., Irvine, CA (USA). Advance Technology Div.**	
	11:29154	DOE/CH/10088—2018
AC02-82ER12015	**Martek Corp., Columbia, MD (USA)**	
	11:29502	DOE/ER/12015—T1
AC02-82ER12028	**Iowa State Univ., Ames**	
	11:30675	Plant Physiology 79 NO. 1. 24-27 (Sep 1985).
AC02-82ER13022	**Rensselaer Polytechnic Inst., Troy, NY (USA)**	
	11:30236	DOE/ER/13022—3
AC02-82ER53140	**Grumman Aerospace Corp., Bethpage, NY (USA)**	
	11:30964	DOE/ER/53140—24
AC02-82ER60055	**Pennsylvania State Univ., University Park**	
	11:30212	Journal of Physical Chemistry 90 NO. 1. 100-104 (2 Jan 1986).
AC02-83CH10093	**Solar Energy Research Inst., Golden, CO (USA)**	
	11:29602	SERI/TP—250-2933
	11:29603	SERI/TP—252-2919
	11:29604	SERI/TR—252-2704
AC02-83CH10140	**Earth Technology Corp., Long Beach, CA (USA)**	
	11:30738	BMI/ONWI—585
	Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation	
	11:30739	BMI/ONWI—587
AC02-83ER13076	**Univ. of Wisconsin, Madison**	
	11:30677	Plant Physiology 79 NO. 1. 202-206 (Sep 1985).

Contract No.	Abstract No.	Report No.
AC02-83ER13109	**Purdue Univ., West Lafayette, IN**	
	11:30645	Plant Physiology 79 NO. 1. 138-142 (Sep 1985).
AC02-83ER13112	**State Univ. of New York, Stony Brook (USA). Dept. of Earth and Space Sciences**	
	11:30758	DOE/ER/13112—3
AC02-83ER40085	**Tufts Univ., Medford, MA (USA)**	
	11:30824	DOE/ER/40085—10
AC02-83ER60134	**New York Univ., NY (USA). Inst. of Environmental Medicine**	
	11:30580	DOE/ER/60134—2
AC02-84ER13151	**Univ. of Rochester, NY**	
	11:30288	Journal of the American Chemical Society 108 NO. 1. 175-177 (8 Jan 1986).
AC03-76SF00012	**Division of Nuclear Medicine and Biophysics, UCLA School of Medicine, and Laboratory of Nuclear Medi**	
	11:30439	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
AC03-76SF00098	**Lawrence Berkeley Lab., CA (USA)**	
	11:29235	LBL—21111
	11:29405	LBL—20738
	Meridian Corp., Falls Church, VA (USA)	
	11:29614	CONF-8509142—(1985).
	Lawrence Berkeley Lab., CA (USA)	
	11:29902	LBL—20816
	11:29988	STES (Seasonal Thermal Energy Storage) Newsletter 7 NO. 1. 1-6 (Dec 1984).
	11:30000	LBL—17585
	11:30001	LBL—18306
	Alberta Univ., Edmonton (Canada). Dept. of Mechanical Engineering	
	11:30002	LBL—18732
	Lawrence Berkeley Lab., CA (USA)	
	11:30003	LBL—20348
	11:30004	LBL—20950
	11:30033	LBL—18914
	11:30043	(1984).
	11:30100	LBL—20485
	11:30117	Corrosion Science 23 NO. 3. 285-290 (1983).
	11:30161	LBL—21214
	11:30197	Journal of Physical Chemistry 90 NO. 8. 1502-1504 (10 Apr 1986).
	11:30199	Journal of Physical Chemistry 90 NO. 8. 1671-1676 (10 Apr 1986).
	11:30203	Journal of Physical Chemistry 90 NO. 6. 1065-1069 (13 Mar 1986).
	11:30239	Journal of Physical Chemistry 90 NO. 8. 1577-1581 (10 Apr 1986).
	11:30273	Organometallics 3 NO. 2. 293-298 (1984).
	11:30317	Journal of the American Chemical Society 108 NO. 2. 335-336 (22 Jan 1986).
	11:30324	LBL—21299
	11:30342	LBL—19406
	11:30343	LBL-PUB—3054
	11:30410	LBL—21255
	11:30425	LBL—20664
	11:30537	LBL—20654
	11:30629	Plant Physiology 78 NO. 4. 807-811 (Aug 1985).
	11:30642	Biochimica et Biophysica Acta 722 364-371 (1983).
	11:30643	Biochimica et Biophysica Acta 722 327-330 (1983).
	11:30669	Plant Physiology 78 NO. 3. 661-664 (Jul 1985).
	11:30698	Plant Physiology 77 NO. 2. 313-317 (Feb 1985).
	Geological Survey, Menlo Park, CA (USA)	
	11:30747	LBL—20020

Contract No.	Abstract No.	Report No.
	Lawrence Berkeley Lab., CA (USA)	
	11:30783	LBL—21126
	11:30814	LBL—21260
	11:30937	LBL—21165
	11:31077	LBL—21174
AC03-76SF00515	**Stanford Linear Accelerator Center, Menlo Park, CA (USA)**	
	11:30414	SLAC-CN—326
	11:30435	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30442	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30443	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30444	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30445	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30449	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30450	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30452	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30455	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30457	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30462	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30476	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30478	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30499	SLAC-PUB—3867
	California Univ., Santa Cruz (USA). Inst. for Particle Physics	
	11:30845	SLAC-PUB—3845
	Stanford Linear Accelerator Center, Menlo Park, CA (USA)	
	11:30846	SLAC-PUB—3904
	11:30887	SLAC-PUB—3902
AC03-76SF01012	**Univ. of California, San Francisco**	
	11:30700	Radiation Research 100 87-95 (1984).
AC03-77EV01525	**San Diego State Univ., CA (USA). Systems Ecology Research Group**	
	11:30591	DOE/EV/01525—T6
AC03-81ER10906	**SRI International, Menlo Park, CA**	
	11:30208	Journal of Physical Chemistry 90 NO. 3. 487-491 (30 Jan 1986).
AC03-83SF11918	**TPI, Inc., Bethesda, MD (USA)**	
	11:29565	DOE/SF/11918—T2

Contract No.	Abstract No.	Report No.
AC03-83SF11929	**GA Technologies, Inc., San Diego, CA (USA)**	
	11:29513	GA-A—18285
AC03-84ER51044	**GA Technologies, Inc., San Diego, CA (USA)**	
	11:30969	GA-A—18380
	11:31069	GA-A—18388
AC03-84ER53158	**GA Technologies, Inc., San Diego, CA (USA)**	
	11:30970	GA-A—18412
	11:30971	GA-A—18414
	11:30972	GA-A—18415
AC03-84SF12197	**Brown Univ., Providence, RI (USA). Div. of Engineering**	
	11:30377	DOE/SF/12197—T6
AC04-76DP00053	**Monsanto Research Corp., Miamisburg, OH (USA). Mound**	
	11:30196	MLM—3347
AC04-76DP00613	**Allied Corp., Kansas City, MO (USA). Bendix Kansas City Div.**	
	11:30176	BDX—613-3262
	11:30332	BDX—613-3476
	11:30391	BDX—613-3477
AC04-76DP00789	**Sandia National Labs., Albuquerque, NM (USA)**	
	11:29251	SAND—85-2075C
	11:29305	SAND—85-1016
	Hanford Engineering Development Lab., Richland, WA (USA)	
	11:29307	SAND—86-1088C
	Sandia National Labs., Albuquerque, NM (USA)	
	11:29417	SAND—83-1982C
	Harvard Univ., Boston, MA (USA). School of Public Health	
	11:29448	NUREG/CR—4214(Jul 1985).
	Sandia National Labs., Albuquerque, NM (USA)	
	11:29454	SAND—86-0009
	Sanders Associates, Inc., Nashua, NH (USA). Defense and Information Systems Div.	
	11:29607	SAND—85-7007
	Sandia National Labs., Albuquerque, NM (USA)	
	11:29608	SAND—86-0303C
	11:29623	SAND—85-2712C
	Meridian Corp., Falls Church, VA (USA)	
	11:29635	CONF-8509142—(1985).
	Sandia National Labs., Albuquerque, NM (USA)	
	11:29639	SAND—85-2843
	Meridian Corp., Falls Church, VA (USA)	
	11:29641	CONF-8509142—(1985).
	Sandia National Labs., Albuquerque, NM (USA)	
	11:29664	SAND—85-0957
	11:29797	DOE/DP/00789—T246
	11:29813	SAND—86-0476C
	11:29822	SAND—85-2103C
	11:29823	SAND—85-2152C
	11:29861	SAND—85-1616C
	11:29862	SAND—86-0027C
	New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering	
	11:29863	SAND—86-0255C
	11:29864	SAND—86-0277C
	Meridian Corp., Falls Church, VA (USA)	
	11:29910	CONF-8509142—(1985).
	Sandia National Labs., Albuquerque, NM (USA)	
	11:30163	SAND—85-2446C
	11:30164	SAND—86-0065
	11:30166	Applied Physics Letters 48 NO. 17. 1144-1146 (28 Apr 1986).
	11:30201	Journal of Physical Chemistry 90 NO. 7. 1360-1365 (27 Mar 1986).
	11:30283	Journal of Physical Chemistry 89 NO. 25. 5473-5476 (5 Dec 1985).
	11:30330	SAND—85-2550C
	11:30345	SAND—85-1804C
	11:30346	SAND—85-1840C
	Fracture Control Corp., Goleta, CA (USA)	
	11:30347	SAND—85-7243
	Sandia National Labs., Albuquerque, NM (USA)	
	11:30348	SAND—86-0051C
	11:30349	SAND—86-0052C
	11:30351	SAND—86-0916C
	11:30352	SAND—86-0966C
	11:30386	SAND—86-0079C
	11:30387	SAND—86-0088C
	11:30388	SAND—86-1024C
	Sandia National Labs., Livermore, CA (USA)	
	11:30389	SAND—86-8219
	11:30398	Journal of Applied Physics 59 NO. 11. 3709-3715 (1 Jun 1986).
	Sandia National Labs., Albuquerque, NM (USA)	
	11:30742	SAND—85-0855
	11:30749	SAND—85-0123C
	11:30750	SAND—85-2124C
	11:30751	SAND—85-2237C
	11:30752	SAND—85-2238C
	11:30753	SAND—85-2273C
	11:30755	SAND—86-0412C
	Wisconsin Univ., Madison (USA). Fusion Technology Inst.	
	11:30982	SAND—86-0283
	Sandia National Labs., Albuquerque, NM (USA)	
	11:31080	SAND—86-0017C
	11:31081	SAND—86-0057C
	11:31284	SAND—85-2389
	11:31285	SAND—85-2511
	11:31286	SAND—86-0249
AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
	11:29413	RFP—3871
AC04-76DR00789	**Sandia National Labs., Livermore, CA (USA)**	
	11:29609	SAND—86-8007
AC04-76EV01013	**Inhalation Toxicology Research Institute, Albuquerque, NM**	
	11:29227	Environmental Health Perspectives 47 283-292 (1983).
	11:30554	American Industrial Hygiene Association Journal 44 NO. 4. 292-295 (Apr 1983).
AC04-78AL10752	**New Mexico Health and Environment Dept., Santa Fe (USA). Environmental Evaluation Group**	
	11:30740	EEG—32
AC04-80SF10791	**Sandia National Labs., Albuquerque, NM (USA)**	
	11:30350	SAND—86-0056C
AC04-82AL14086	**Arizona Univ., Tucson (USA). Coll. of Engineering**	
	11:29325	CONF-850314—Vol.2(1985).
AC05-76OR00033	**Oak Ridge Associated Universities, Inc., TN (USA)**	
	11:31271	DOE/ER—0268
AC05-84OR21400	**Oak Ridge National Lab., TN (USA)**	
	11:29152	ORNL—6264
	11:29167	ORNL/FMP—86/1
	11:29185	Environmental Science and Technology 20 NO. 3. 291-295 (Mar 1986).
	11:29292	CONF-860603—1
	11:29293	CONF-860603—2
	11:29295	ORNL/TM—9913
	11:29296	ORNL/TM—9926
	H and R Technical Associates, Inc., Oak Ridge, TN (USA)	
	11:29298	CONF-860604—2

Contract No.	Abstract No.	Report No.
	Arizona Univ., Tucson (USA). Coll. of Engineering	
	11:29329	CONF-850314—Vol.2(1985).
	11:29330	CONF-850314—Vol.2(1985).
	11:29341	CONF-850314—Vol.2(1985).
	11:29373	CONF-850314—Vol.2(1985).
	11:29374	CONF-850314—Vol.2(1985).
	11:29375	CONF-850314—Vol.2(1985).
	11:29376	CONF-850314—Vol.2(1985).
	Oak Ridge National Lab., TN (USA)	
	11:29398	CONF-860610—11
	11:29409	ORNL/TM—9680-Pt.2
	11:29445	CONF-860695—1
	Human Resources Management, Inc., Washington, DC (USA)	
	11:29496	DOE/CS/30475—T3
	Oak Ridge National Lab., TN (USA)	
	11:29546	ORNL/TM—10018
	11:29748	CONF-860204—41
	11:29774	NUREG/CR—4022
	11:29778	CONF-860610—9
	11:29791	CONF-860415—4
	11:29796	CONF-860675—1
	11:29802	NUREG/CR—4380
	11:29809	CONF-860414—2
	11:29817	CONF-860414—3
	11:29818	CONF-860605—3
	11:29821	NUREG/CR—3064-Vol.2
	11:29833	DOE/OR/21400—T258
	11:29854	NUREG/CR—4047
	11:29855	NUREG/CR—4332
	11:29856	NUREG/CR—4338
	11:29858	NUREG/CR—4449
	11:29859	NUREG/CR—4489
	11:30015	ORNL/M—149
	Massachusetts Inst. of Tech., Cambridge (USA)	
	11:30016	ORNL/Sub—84-97333/1
	Oak Ridge National Lab., TN (USA)	
	11:30048	CONF-860676—1
	11:30080	CONF-860421—25
	11:30081	CONF-860421—28
	11:30085	CONF-860605—9
	11:30086	CONF-860605—10
	11:30087	CONF-860605—11
	11:30088	CONF-860605—13
	11:30089	CONF-860610—5
	11:30090	CONF-860610—21
	11:30124	ORNL/TM—9903
	11:30141	Proceedings - Annual Meeting, Electron Microsopy Society of America 42 582-583 (1984).
	11:30143	CONF-860413—1
	11:30174	Journal of Chromatography 303 13-28 (1984).
	Tennessee Univ., Knoxville (USA)	
	11:30190	CONF-8509147—18
	11:30244	Journal of the American Chemical Society 108 NO. 4. 654-663 (19 Feb 1986).
	Oak Ridge National Lab., TN (USA)	
	11:30308	CONF-850836—11
	11:30312	NAS-NS—3116
	11:30313	ORNL/TM—9958
	11:30314	ORNL/TM—9988
	11:30333	CONF-860604—7
	11:30334	CONF-860604—8
	11:30335	CONF-860610—1
	11:30336	CONF-860610—7
	11:30393	CONF-860693—1
	11:30411	ORNL/M—157
	Manville Service Corp., Denver, CO (USA)	
	11:30498	ORNL/Sub—84-19712/1
	Oak Ridge National Lab., TN (USA)	
	11:30524	CONF-860163—1
	Environmental Protection Agency, Washington, DC (USA)	
	11:30578	CONF-8511179—1
	Martin Marietta Energy Systems, Inc., Oak Ridge, TN (USA)	
	11:30584	ORNL—6271
	Oak Ridge National Lab., TN (USA)	
	11:30609	CONF-860161—1
	11:30612	Environmental Science and Technology 20 NO. 3. 260-267 (Mar 1986).
	11:30631	Plant Physiology 78 NO. 2. 427-429 (Jul 1985).
	11:30651	CONF-8606111—2
	11:30652	CONF-8606111—3
	11:30661	CONF-8606111—1
	11:30702	Transactions of the American Fisheries Society 113 666-671 (1984).
	11:30720	ORNL—6248
	11:30735	CONF-8603100—1
	11:30737	ORNL/TM—9918
	11:30741	ORNL—6148
	Laseronics, Inc., Los Angeles, CA (USA)	
	11:30811	CONF-860622—1
	Oak Ridge National Lab., TN (USA)	
	11:30946	CONF-860610—3
	11:31024	CONF-860170—2
	11:31025	CONF-860170—3
	11:31026	CONF-860412—5
	McDonnell Douglas Astronautics Co., St. Louis, MO (USA)	
	11:31027	CONF-860412—6
	Oak Ridge National Lab., TN (USA)	
	11:31028	CONF-860412—8
	11:31029	CONF-860610—19
	11:31030	CONF-860610—20
	11:31031	CONF-860610—22
	USDOE Office of Energy Research, Washington, DC. Development and Technology Div.	
	11:31067	DOE/ER—0113/5
	Oak Ridge National Lab., TN (USA)	
	11:31068	DOE/OR/21400—T239
	Los Alamos National Lab., NM (USA)	
	11:31076	LA-UR—86-1386
	11:31085	Fusion Technology 9 NO. 2. vp (Mar 1986).
AC05-84OS21400	**Oak Ridge Y-12 Plant, TN (USA)**	
	11:30106	Y/DV—420
AC05-84OT21400	**Oak Ridge Gaseous Diffusion Plant, TN (USA)**	
	11:29453	K/OA—6004
	11:30328	K/CSD/INF—86/5
	11:30385	K/PS—5068-EX
AC06-76FF02170	**Hanford Engineering Development Lab., Richland, WA (USA)**	
	11:29306	SAND—86-0053C
	11:29750	HEDL—7467
	11:30096	HEDL-SA—3291
	11:30097	HEDL-SA—3407-FP
	11:30340	HEDL-SA—3467-FP
AC06-76RL01830	**Pacific Northwest Labs., Richland, WA (USA)**	
	11:29302	PNL—5731
	11:29303	PNL—5777-Vol.1
	11:29304	PNL-SA—13395
	Arizona Univ., Tucson (USA). Coll. of Engineering	
	11:29379	CONF-850314—Vol.2(1985).
	Pacific Northwest Labs., Richland, WA (USA)	
	11:29410	PNL—5745
	11:29411	PNL-SA—13396
	11:29412	PNL-SA—13733
	11:29441	NUREG/CR—4520
	11:29446	NUREG/CR—2675-Vol.5
	11:29450	PNL—5841
	11:29486	PNL—5801
	11:29601	PNL—5629
	11:29753	NUREG/CR—4330-Vol.1
	Battelle Human Affairs Research Center, Seattle, WA (USA)	
	11:29792	NUREG/CR—4436-Vol.2
	Pacific Northwest Labs., Richland, WA (USA)	
	11:29851	NUREG/CR—3365
	11:29852	NUREG/CR—3517
	11:29857	NUREG/CR—4412

Contract No.	Abstract No.	Report No.
	11:29983	American Ceramic Society Bulletin 63 NO. 4. 619-627 (Apr 1984).
	11:30105	PNL-SA—13067
	11:30182	Journal of Physical Chemistry 89 NO. 25. 5526-5530 (5 Dec 1985).
	11:30224	Spectrochimica Acta, Part B: Atomic Spectroscopy 40B NO. 1/2. 357-365 (1985).
	11:30306	Materials Research Society Symposia Proceedings 44 671-678 (1985).
	11:30344	PNL—5646
	11:30359	Journal of the Aeronautical Society of India 36 NO. 3. 145-152 (Aug 1984).
	11:30440	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30506	American Laboratory 82-91 (Mar 1984).
	Research Triangle Inst., Research Triangle Park, NC (USA)	
	11:30557	EPRI-CS—4404-Vol.4(Feb 1986).
	11:30585	Environmental Monitoring and Assessment 4 379-388 (1984).
	Pacific Northwest Labs., Richland, WA (USA)	
	11:30604	PNL—5506
	11:30696	PNL—5750-Pt.1
	11:30725	Chromatographia 18 NO. 11. 603-610 (Nov 1984).
	11:31272	PNL—5812
AC06-76RL01831	**Nob Hill Animal Clinic, Yakima, WA**	
	11:30673	Modern Veterinary Practice 753-757 (Oct 1984).
AC06-77RL01030	**Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations**	
	11:29414	RHO-BW-SA—344-P
	11:29415	RHO-BW-ST—73-P
	11:29416	RHO-RE-PL—34-P
	11:30616	RHO-RE-SA—116-P
	11:30617	RHO-RE-SR—85-24-P
AC07-76ID01570	**Arizona Univ., Tucson (USA). Coll. of Engineering**	
	11:29362	CONF-850314—Vol.2(1985).
	EG and G Idaho, Inc., Idaho Falls (USA)	
	11:29399	CONF-8509121—
	11:29629	EGG-EP—7076
	11:29834	EGG-M—18085
	11:29843	GEND—055
	Meridian Corp., Falls Church, VA (USA)	
	11:29913	CONF-8509142—(1985).
	Idaho National Engineering Lab., Idaho Falls (USA)	
	11:30383	EGG-M—05585
	EG and G Idaho, Inc., Idaho Falls (USA)	
	11:30384	EGG-M—27784
AC07-80NV10081	**Magma Gulf/Technadril, Houston, TX (USA)**	
	11:29638	DOE/NV/10081—3-Pts.1-2
AC08-83NV10282	**EG and G Energy Measurements, Inc., Las Vegas, NV (USA)**	
	11:30583	EGG—10282-1084
	11:30667	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	EG and G, Inc., Los Alamos, NM (USA). Los Alamos Operations	
	11:30808	DOE/NV/10282—5013
AC08-84NV10327	**Arizona Univ., Tucson (USA). Coll. of Engineering**	
	11:29327	CONF-850314—Vol.2(1985).
	11:29340	CONF-850314—Vol.2(1985).
	Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (USA). Occupational Safety	
	11:30736	DOE/NV/10327—24
AC09-76SR00001	**Bechtel National, Inc., San Francisco, CA (USA)**	
	11:29299	DP-MS—86-37
	Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.	
	11:29436	DP-MS—85-138
	11:30219	Inorganic Chemistry 24 NO. 23. 3888-3890 (6 Nov 1985).
	11:30378	DP-MS—85-140
	11:30496	DP—1714
	11:30582	DP—1717
	South Carolina Univ., Columbia (USA). Dept. of Geography	
	11:30595	DP-MS—85-119
	11:30620	DP-MS—85-120
	11:30731	American Industrial Hygiene Association Journal 46 NO. 9. 488-496 (Sep 1985).
AC11-76PN00014	**Bettis Atomic Power Lab., West Mifflin, PA (USA)**	
	11:29781	WAPD-TM—1278
AC18-80FC10225	**Research Triangle Inst., Research Triangle Park, NC (USA)**	
	11:29701	EPRI-CS—4404-Vol.2(Feb 1986).
AC19-81BC10467		
	11:30046	(1984).
AC19-85BC10830	**Keplinger Technology Consultants, Inc., Tulsa, OK (USA)**	
	11:29233	DOE/BC/10830—3
AC21-82MC19210	**General Electric Co., Schenectady, NY (USA). Corporate Research and Development Center**	
	11:29156	DOE/MC/19210—2043
AC21-83MC20183	**State Univ. of New York, Buffalo**	
	11:30183	Separation Science and Technology 20 NO. 9-10. 725-747 (Nov-Dec 1985).
AC21-85MC21353	**EG and G/Washington Analytical Services Center, Inc., Morgantown, WV (USA)**	
	11:29157	DOE/METC—86/2025
AC22-83PC60015	**Wyoming Univ., Laramie (USA). Office of Univ. Research**	
	11:29175	DOE/PC/60015—36
AC22-84PC70771	**Energy and Environmental Research Corp., Irvine, CA (USA)**	
	11:29187	DOE/PC/70771—T3
AC22-85PC81210	**Michigan Technological Univ., Houghton (USA). Inst. of Materials Processing**	
	11:29208	DOE/PC/81210—T10
AC79-81BP24574	**Oregon Univ., Eugene (USA). Solar Monitoring Lab.**	
	11:29497	DOE/BP/24574—2
AI01-76ET20356	**Jet Propulsion Lab., Pasadena, CA (USA)**	
	11:29504	DOE/JPL/1012—112
	11:29559	DOE/JPL—1012-114
AI01-76PR06010	**National Bureau of Standards, Washington, DC (USA). Center for Building Technology**	
	11:29600	NBSIR—86-3346
	National Bureau of Standards, Washington, DC (USA)	
	11:29612	NBSIR—86-3325
	11:30243	Journal of Physical Chemistry 90 NO. 6. 1152-1155 (13 Mar 1986).
AI01-77CS51040	**Stirling Thermal Motors, Inc., Ann Arbor, MI (USA)**	
	11:30049	DOE/NASA—0351-1
AI01-85CE50112	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	11:30091	DOE/NASA/50112—64
AI08-76DP00474	**Geological Survey, Denver, CO (USA). Water Resources Div.**	
	11:30745	USGS/WRI—84-4296
AI08-78ET44802	**Geological Survey, Reston, VA (USA)**	
	11:30744	USGS-PP—1329

Contract No.	Abstract No.	Report No.
	Geological Survey, Denver, CO (USA)	
	11:30746	CONF-8506104—3
	11:30748	USGS-OFR—86-46
AI79-82BP33825	**Nez Perce Tribe, Lapwai, ID (USA). Fisheries Resource Management**	
	11:30621	DOE/BP/33825—1
AI79-83BP11982	**USDOE Bonneville Power Administration, Portland, OR. Div. of Fish and Wildlife**	
	11:30685	DOE/BP/11982—1
AI79-83BP39644	**National Marine Fisheries Service, Seattle, WA (USA). Coastal Zone and Estuarine Studies Div.**	
	11:29494	DOE/BP/39644—1
AI79-84BP18966	**Montana Dept. of Fish, Wildlife and Parks, Kalispell (USA)**	
	11:30590	DOE/BP/18966—1
AI79-85BP20733	**National Marine Fisheries Service, Portland, OR (USA). Environmental and Technical Services Div.**	
	11:29493	DOE/BP/20733—1
AM06-70RL02225	**Washington Univ., Seattle (USA). Dept. of Zoology**	
	11:30594	DOE/RL/02225—19
AS03-76ER72018	**Stanford Univ., CA (USA). Systems Optimization Lab.**	
	11:30961	SOL—86-3
AS03-84ER52103	**California Univ., Los Angeles (USA). School of Engineering and Applied Science**	
	11:31032	CONF-860652—3
	California Univ., Los Angeles (USA). Dept. of Mechanical, Aerospace and Nuclear Engineering	
	11:31033	CONF-860652—4
AS05-76ER04928	**Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics**	
	11:30851	DOE/ER/04928—7
	11:30852	DOE/ER/04928—8
	11:30853	DOE/ER/04928—10
	11:30854	DOE/ER/04928—11
	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)	
	11:30855	DOE/ER/04928—12
	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics	
	11:30856	DOE/ER/04928—13
AS05-78ER06030	**Georgia Inst. of Tech., Atlanta (USA). Georgia Technology Research Inst.**	
	11:30234	DOE/ER/06030—T4
AS05-78EV06022	**Chemistry Department, University of Florida, Gainesville, Florida 32611**	
	11:30399	Review of Scientific Instruments 57 NO. 5. 957-966 (May 1986).
AS05-80ER10628	**Univ. of Oklahoma, Norman**	
	11:30641	HortScience 18 NO. 6. 903-905 (Dec 1983).
	11:30656	HortScience 17 NO. 4. 635-637 (Aug 1982).
AS05-80ER10745	**Wake Forest Univ., Winston-Salem, NC**	
	11:30242	Journal of Physical Chemistry 90 NO. 6. 1126-1129 (13 Mar 1986).
AS05-81ER10803	**Florida State Univ., Tallahassee (USA)**	
	11:29501	DOE/ER/10803—5
AS05-81ER10947	**Univ. of Texas, Austin**	
	11:30632	Nature (London) 314 NO. 6010. 438-441 (4 Apr 1985).
AS05-82ER53134	**Auburn Univ., AL (USA). Dept. of Physics**	
	11:30962	DOE/ER/53134—T1
	11:30963	DOE/ER/53134—T2
AS05-83ER60158	**Maryland Univ., Baltimore (USA). Dept. of Pathology**	
	11:30715	DOE/ER/60158—2
AS05-83OR21356	**Pennsylvania State Univ., University Park**	
	11:30546	Atmospheric Environment 20 NO. 1. 59-70 (1986).
AS05-84ER13159	**Texas Tech Univ., Lubbock**	
	11:30260	Journal of Organic Chemistry 50 NO. 26. 5556-5559 (27 Dec 1985).
AS09-76EV00936	**Great Lakes Environmental Research Lab., Ann Arbor, MI**	
	11:30657	Journal of Plankton Research 4 NO. 3. 725-734 (1982).
AS09-79ER10434	**South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy**	
	11:30930	DOE/ER/10434—6
AS09-80ER10690	**South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy**	
	11:30823	DOE/ER/10690—6
AS19-81BC10507	**Univ. of Georgia, Athens**	
	11:29247	Developments in Industrial Microbiology 25 NO. 2. 31-40 (1984).
FC21-83FE60181	**Univ. of North Dakota Energy Research Center, Grand Forks**	
	11:30268	Analytical Chemistry 57 NO. 3. 694-698 (Mar 1985).
FC21-84MC21136	**New Mexico Inst. of Mining and Technology, Socorro (USA). New Mexico Petroleum Recovery Research Center**	
	11:29234	DOE/MC/21136—6
FG01-81ER40020	**National Research Council, Washington, DC (USA). Numerical Data Advisory Board**	
	11:30890	DOE/ER/40020—T2
FG01-84CE15192	**Ohio State Univ., Columbus (USA). Dept. of Welding Engineering**	
	11:30394	DOE/CE/15192—T1
	11:30395	DOE/CE/15192—T2
FG01-84ER13259	**South Dakota School of Mines and Technology, Rapid City (USA). Inst. for the Study of Mineral Deposits**	
	11:30759	DOE/ER/13259—T2
FG02-79ER10535	**Ben-Gurion Univ. of the Negev, Beersheva, Israel**	
	11:30241	Journal of Physical Chemistry 90 NO. 6. 1069-1073 (13 Mar 1986).
FG02-83NE44352	**Massachusetts Dept. of Public Health, Boston (USA)**	
	11:29400	DOE/NE/44352—1
FG02-84ER13212	**Physics Department, Purdue University, W. Lafayette, Indiana 47907**	
	11:30168	Physical Review [Section] B: Condensed Matter 33 NO. 8. 5825-5833 (15 Apr 1986).
FG02-84ER13235	**Brown Univ., Providence, RI**	
	11:30294	Journal of Chemical Physics 81 NO. 2. 812-819 (15 Jul 1984).
FG02-84ER13260	**Kent State Univ., OH (USA)**	
	11:30237	DOE/ER/13260—T2
FG02-84ER13261	**Univ. of Nebraska, Lincoln**	
	11:30285	Journal of Physical Chemistry 90 NO. 6. 983-987 (13 Mar 1986).
FG03-84CE50036	**Santa Clara Univ., CA (USA)**	
	11:30069	DOE/CE/50036—H1
FG03-85SF15799	**Hawaii Univ., Honolulu (USA). Hawaii Natural Energy Inst.**	
	11:29642	DOE/SF/15799—T5
FG05-80ET53088	**Univ. of Texas, Austin**	
	11:31093	Laser and Particle Beams 3 351-413 (Nov 1985).
FG05-84ER40157	**Virginia Univ., Charlottesville (USA). Beams Physics Lab.**	
	11:30947	DOE/ER/40157—3
FG05-84ER45113	**Virginia Univ., Charlottesville (USA). Dept. of Physics**	
	11:30337	DOE/ER/45113—2

Contract No.	Abstract No.	Report No.
FG05-85ER13394	Virginia Univ., Charlottesville (USA). Dept. of Physics	
	11:30812	DOE/ER/13394—1
FG05-85ER13456	Tennessee Univ., Knoxville (USA). Dept. of Physics	
	11:30813	DOE/ER/13456—1
FG05-85ER53206	Auburn Univ., AL (USA). Dept. of Physics	
	11:30965	DOE/ER/53206—T1
FG07-82CE40545	Massachusetts Institute of Technology, Cambridge	
	11:30217	Inorganic Chemistry 24 NO. 23. 3881-3884 (6 Nov 1985).
FG08-84ER13234	Nevada Univ., Reno (USA). Desert Research Inst.	
	11:29503	DOE/ER/13234—2
FG22-82PC50803	Purdue Univ., Lafayette, IN (USA). Dept. of Chemistry	
	11:29174	DOE/PC/50803—T1
FG22-83PC60039	Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering	
	11:29176	DOE/PC/60039—8
FG22-83PC60787	Oklahoma State Univ., Stillwater (USA). School of Chemical Engineering	
	11:29159	DOE/PC/60787—10
FG22-83PC60791	Yale Univ., New Haven, CT (USA). Dept. of Chemistry	
	11:29177	DOE/PC/60791—9
FG22-83PC60800	Brown Univ., Providence, RI (USA). Div. of Engineering	
	11:29160	DOE/PC/60800—10
FG22-83PC60802	Arizona Univ., Tucson (USA). Dept. of Chemical Engineering	
	11:29186	DOE/PC/60802—10
FG22-84PC70006	Colorado School of Mines, Golden (USA). Dept. of Chemical Engineering and Petroleum Refining	
	11:29178	DOE/PC/70006—9
FG22-84PC70061	Massachusetts Inst. of Tech., Cambridge (USA)	
	11:29179	DOE/PC/70061—7
FG22-84PC70781	Illinois Univ., Chicago (USA). Dept. of Chemical Engineering	
	11:29180	DOE/PC/70781—T5
FG22-84PC70782	Illinois Univ., Urbana (USA)	
	11:29181	DOE/PC/70782—6
FG22-84PC70792	Purdue Univ., Lafayette, IN (USA). Lab. of Renewable Resources Engineering	
	11:29182	DOE/PC/70792—T6
FG22-84PC70794	Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.	
	11:29217	DOE/PC/70794—6
FG22-84PC70796	Utah Univ., Salt Lake City (USA). Dept. of Fuels Engineering	
	11:29204	DOE/PC/70796—8
FG22-84PC70799	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)	
	11:29183	DOE/PC/70799—T5
FG22-84PC70801	Illinois Univ., Urbana (USA). Dept. of Chemical Engineering	
	11:29161	DOE/PC/70801—T6
FG22-84PC70802	Tuskegee Inst., AL (USA). Dept. of Chemical Engineering	
	11:29162	DOE/PC/70802—T2
FG22-84PC70803	Princeton Univ., NJ (USA). Dept. of Chemical Engineering	
	11:29205	DOE/PC/70803—T6
FG22-84PC70811	SRI International, Menlo Park, CA (USA)	
	11:29163	DOE/PC/70811—5
FG22-85PC80517	Michigan Univ., Ann Arbor (USA). Dept. of Chemical Engineering	
	11:29206	DOE/PC/80517—T1
FG22-85PC80530	Utah Univ., Salt Lake City (USA). Dept. of Metallurgy	
	11:29207	DOE/PC/80530—T2
FG22-85PC80532	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Chemistry	
	11:30238	DOE/PC/80532—3
FG22-85PC80911	Rockwell International Corp., Thousand Oaks, CA (USA). Science Center	
	11:29184	DOE/PC/80911—T2
FG44-77CS60210	Florida Governor's Energy Office, Tallahassee (USA)	
	11:29920	DOE/CS/60210—T1
FM02-82FE55014	ANG Coal Gasification Co., Beulah, ND (USA)	
	11:29155	DOE/FE/55014—T21
	11:29198	DOE/FE/55014—T20
NAS-7-100-956679	Purdue Research Foundation, Lafayette, IN (USA)	
	11:29505	DOE/JPL/956679—84/6
W-31-109-ENG-38	Argonne National Lab., IL (USA)	
	11:29460	ANL/CNSV-TM—174
	11:29669	CONF-860635—1
	Argonne National Lab., Idaho Falls, ID (USA)	
	11:29777	CONF-860605—7
	Argonne National Lab., IL (USA)	
	11:29779	CONF-860610—10
	11:29788	NUREG/CR—4568
	11:29800	NUREG/CR—4348-Vol.1
	11:29801	NUREG/CR—4348-Vol.2
	11:29860	NUREG/CR—4505
	11:30082	CONF-860605—2
	11:30083	CONF-860605—6
	11:30084	CONF-860605—8
	11:30187	Journal of Membrane Science 20 201-213 (1984).
	11:30206	Journal of Physical Chemistry 90 NO. 3. 344-356 (30 Jan 1986).
	11:30211	Journal of Physical Chemistry 90 NO. 1. 56-61 (2 Jan 1986).
	11:30226	Journal of Fluorine Chemistry 27 249-256 (1985).
	11:30245	Journal of the American Chemical Society 108 NO. 4. 695-702 (19 Feb 1986).
	11:30272	Molecular Crystals and Liquid Crystals 107 81-90 (1984).
	11:30282	Journal of Physical Chemistry 90 NO. 8. 1572-1577 (10 Apr 1986).
	11:30301	Journal of Physical Chemistry 90 NO. 8. 1560-1564 (10 Apr 1986).
	11:30304	Chemical Physics Letters 113 NO. 3. 316-319 (18 Jan 1985).
	11:30318	Journal of the American Chemical Society 108 NO. 1. 40-56 (8 Jan 1986).
	11:30448	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30525	CONF-860390—1
	11:30526	CONF-8506213—2
	Environmental Protection Agency, Washington, DC (USA)	
	11:30556	EPA—520/5-83/021(Sep 1983).
	11:30635	Journal of Chromatography 323 418-423 (1985).
	Argonne National Lab., IL (USA)	
	11:30848	ANL-HEP-CP—86-19
	11:31276	ANL/TM—431-Rev.
	11:31277	ANL/TM—438
	11:31293	ANL/TM—436
W-7405-ENG-26	Oak Ridge National Lab., TN	
	11:29424	Hydrometallurgy 13 15-32 (1984).
	11:29426	ACS Symposium Series NO. 246. 335-346 (1984).
	11:29790	Land Economics 58 NO. 1. 118-130 (Feb 1982).

Contract No.	Abstract No.	Report No.
	11:30116	Acta Crystallographica, Section A: Crystal Physics, Diffraction, Theoretical and General C
	11:30140	Journal of Crystal Growth 67 556-558 (1984).
	11:30142	Oxidation of Metals 19 NO. 1/2. 19-25 (1983).
	11:30188	Proceedings of the Society of Photo-Optical Instrumentation Engineers 426 13-17 (1983).
	11:30227	Journal of the Electrochemical Society 131 NO. 4. 853-857 (Apr 1984).
	11:30231	Inorganic Chemistry 23 NO. 10. 1398-1404 (1984).
	11:30275	Spectrochimica Acta, Part A: Molecular Spectroscopy 40A NO. 5. 411-418 (1984).
	11:30277	International Journal of Mass Spectrometry and Ion Physics 61 215-230 (1984).
	11:30555	Science (Washington, D.C.) 211 167-169 (9 Jan 1981).
	Envirotest, Seattle, WA (USA)	
	11:30601	EPRI-EA—4438(Feb 1986).
	11:30638	Journal of Biological Chemistry 259 NO. 5. 3102-3110 (10 Mar 1984).
	11:30672	Developmental Biology 1 235-288 (1985).
W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	11:29294	LA-UR—86-273
	11:29403	LA—10449-MS
	11:29404	LA—10574-MS
	11:29622	LA—10659-HDR-Vol.1
	11:29844	LA-UR—85-3958
	11:29845	LA-UR—85-3959
	11:30098	LA-UR—85-3389
	11:30099	LA-UR—86-733
	11:30160	LA-UR—86-1202
	11:30162	NUREG/CR—3965
	11:30233	Reaction Kinetics and Catalysis Letters 7 NO. 2. 145-150 (1977).
	11:30321	Journal of the Optical Society of America B: Optical Physics 1 NO. 4. 609-625 (Aug 1984).
	11:30341	LA-UR—86-1378
	11:30362	LA-UR—86-996
	11:30363	LA-UR—86-1420
	11:30413	LA-UR—86-1368
	11:30511	LA-UR—85-2954
	11:30512	LA-UR—85-3375
	11:30513	LA-UR—85-3420
	11:30514	LA-UR—85-3554
	11:30618	
	11:30730	LA-tr—86-14(1986).
	11:30809	LA-UR—86-1011
	11:30872	LA-UR—86-1233
	11:30948	LA-UR—85-3347
	11:30958	LA-UR—85-3264
	11:30975	LA—10627-MS
	11:31074	LA-UR—86-641
	11:31075	LA-UR—86-679
W-7405-ENG-48		
	11:29172	(1985).
	Lawrence Livermore National Lab., CA (USA)	
	11:29250	UCRL—94075
	11:29252	UCRL—93429
	11:29418	UCID—20673
	11:29488	Progress in Astronautics and Aeronautics 94 151-174 (1984).
	11:29489	Combustion and Flame 46 191-210 (1982).
	11:29564	UCRL—93207
	Los Alamos National Lab., NM (USA)	
	11:29795	LA—10645-PR

Contract No.	Abstract No.	Report No.
	11:30113	Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films 2 NO. 2. 723-724
	11:30167	Physical Review [Section] B: Condensed Matter 33 NO. 8. 5344-5349 (15 Apr 1986).
	Lawrence Livermore National Lab., CA (USA)	
	11:30175	UCID—20622-86-3
	11:30198	Journal of Physical Chemistry 90 NO. 8. 1509-1519 (10 Apr 1986).
	11:30200	Journal of Physical Chemistry 90 NO. 8. 1706-1717 (10 Apr 1986).
	11:30315	UCRL—94467
	11:30331	UCID—20616
	11:30353	UCRL—93600
	11:30354	UCRL—94208
	11:30407	UCRL—94019
	11:30409	LBL—20979
	11:30438	IEEE (Institute of Electrical and Electronics Engineers) Transactions on Nuclear Science N
	11:30500	UCID—20719
	11:30518	UCID—20689
	11:30519	UCRL—94338
	11:30545	UCRL—94226
	11:30647	Cytometry (Baltimore) 6 92-100 (1985).
	11:30697	UCRL—94428
	11:30756	UCRL—93421
	11:30757	UCRL—93422
	Geological Survey, Menlo Park, CA (USA)	
	11:30761	UCRL—15790
	Lawrence Livermore National Lab., CA (USA)	
	11:30810	UCRL—93549
	11:30951	UCRL—93776
	Illinois Univ., Urbana (USA). Dept. of Electrical and Computer Engineering	
	11:30959	UCRL—92562-Rev.1
	Lawrence Livermore National Lab., CA (USA)	
	11:30983	UCID—20732
	11:30984	UCRL—93878-Rev.1
	11:30985	UCRL—93970
	11:30986	UCRL—94207-Rev.1
	11:31082	UCRL—93834-Rev.1
	11:31083	UCRL—93950
	11:31084	UCRL—94286
	11:31258	Journal of Fusion Energy 4 NO. 2/3. 181-186 (1985).
	11:31259	Journal of Vacuum Science and Technology, A: Vacuum, Surfaces, and Films 2 NO. 2. 653-654
	11:31273	UCRL—94518
	11:31287	UCID—20721
	Kansas Univ., Lawrence (USA). Dept. of Electrical and Computer Engineering	
	11:31288	UCRL—94310
	Lawrence Livermore National Lab., CA (USA)	
	11:31289	UCRL—94340
W-7405-ENG-82	**Iowa State Univ. of Science and Technology, Ames (USA)**	
	11:30184	(1985).
	11:30185	(1985).
	11:30205	Journal of Solid State Chemistry 61 NO. 3. 338-342 (1 Mar 1986).
	11:30222	(1985).
	11:30223	(1985).
	11:30246	Journal of the American Chemical Society 108 NO. 4. 713-719 (19 Feb 1986).
	11:30247	Journal of the American Chemical Society 108 NO. 4. 719-723 (19 Feb 1986).
	11:30270	(1985).
	11:30271	(1985).

REPORT NUMBER INDEX

The numbers assigned to reports cited in this publication appear in the first column of the index. Cross reference information and/or availability are included as appropriate. Abbreviations used in the availability column are elaborated at the end of the index. To expedite the filling of orders for reports from NTIS and OSTI, a file number in the form, DE82000001 or TI82000001, appears in column 3. File numbers with DE prefixes may be used in ordering from both NTIS and OSTI. Numbers with TI prefixes are valid at OSTI only. Requesters are urged to use this file number where provided. In column 4, one or more DOE distribution categories are indicated, e.g., STD-10, MN-25. STD indicates distribution was made in full-size copy; MN indicates microcopy distribution; ND indicates no distribution was made. These category numbers are included to assist DOE librarians in responding to requests for reports in their collections. The UC (Unclassified Distribution Categories) are defined in DOE/TIC-4500, available from OSTI. The citation numbers are given in column 5. NOTE: DOE attempts to disseminate its information as broadly as possible. Even though a report may contain some degree of illegibility, it is believed that the report may still make a contribution. The presence of a 1, 2, or 3 following NTIS in the availability column denotes the extent to which a report may be illegible and the form in which it is available: 1 = 5 to 8% illegibility, available PC and MF; 2 = 9 to 12% illegibility, available MF only; 3 = 13% or more illegibility, available PC only. For the users of DOE/RECON, report ordering may be accomplished more expeditiously via the on-line system. Employees of DOE or DOE contractors are urged to order from the Office of Scientific and Technical Information (OSTI); all others should order from the National Technical Information Service (NTIS). Procedures for on-line ordering are detailed in the DOE/RECON User's Manual (DOE/TIC-4586).

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
AECL-				
7805	NTIS (US Sales Only), PC A04/MF A01	DE84901835	MN -70	11:30147
7809	NTIS (US Sales Only), PC A03/MF A01	DE85900380	MN -78	11:29776
7811	NTIS (US Sales Only), PC A07/MF A01	DE85900464	MN -70	11:29309
7813	NTIS (US Sales Only), PC A03/MF A01	DE84901010	MN -80	11:30070
7816	NTIS (US Sales Only), PC A05/MF A01	DE85901164	MN -70	11:29310
7819	NTIS (US Sales Only), PC A03/MF A01	DE85900684	MN -70	11:29311
7821	NTIS (US Sales Only), PC A03/MF A01	DE85900379	MN -25	11:30119
7824	NTIS (US Sales Only), PC A02/MF A01; 1	DE84901836	MN -70	11:29312
7827	NTIS (US Sales Only), PC A03/MF A01	DE84901834	MN -70	11:29313
8364	NTIS (US Sales Only), PC A04/MF A01	DE85900455	MN -70	11:29430
8365	NTIS (US Sales Only), PC A03/MF A01	DE85900454	MN -70	11:30071
8366	NTIS (US Sales Only), PC A03/MF A01; 1	DE85900685	MN -70	11:30148
8371	NTIS (US Sales Only), PC A03/MF A01	DE85901265	MN -70	11:29431
8374	NTIS (US Sales Only), PC A02/MF A01	DE85900232	MN -70	11:29314
8375	NTIS (US Sales Only), PC A02/MF A01	DE85900683	MN -70	11:29315
8376	NTIS (US Sales Only), PC A04/MF A01	DE85901220	MN -70	11:30149
8380	NTIS (US Sales Only), PC A03/MF A01	DE85900459	MN -70	11:30579
AEEW-M-				
2234	Atomic Energy Establishment, Winfrith Dorchester, Dorset, England	TI86901295	ND -32	11:31275
AEEW-R-				
404	Atomic Energy Establishment, Winfrith, Dorchester, Dorset, England	TI86901245	ND -77	11:29814
423	NTIS (US Sales Only), PC A04/MF A01; 1	DE86901184	MN -77	11:29815
1925	Atomic Energy Establishment, Winfrith Dorchester, Dorset, England	TI86901177	ND -15	11:29451
AERE-R-				
11849	H.M. Stationery Office, London, price Pound 4.00		ND -34C	11:30889
AIF/NESP-				
034	Atomic Industrial Forum, Inc., 7101 Wisconsin Ave., Bethesda, MD 20814-4891	TI86901286	ND -78	11:29747
ANL-				
85-42-Vol.1	*See* NUREG/CR-4348-Vol.1	TI86005237	MN -80	11:29800
85-42-Vol.2	*See* NUREG/CR-4348-Vol.2	TI86005238	MN -80	11:29801
86-4	*See* NUREG/CR-4505	TI86009372	MN -80	11:29860
ANL/CNSV-TM-				
174	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE86009668	MN -61E	11:29460
ANL/EES-TM-				
297	*See* NUREG/CR-4568	TI86009575	MN -80	11:29788
ANL-HEP-CP-				
86-19	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009181	MN -34D	11:30848
ANL-HEP-PR-				
86-04	*See* DOE/ER/40085-10	E 1.99: DE86009946	MN -34D	11:30824
ANL/TM-				
431-Rev.	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE86009663	MN -32	11:31276
436	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE86009491	MN -32	11:31293
438	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99: DE86009665	MN -32	11:31277
ANU-P-				
907	NTIS (US Sales Only), PC A02/MF A01	DE86701815	MN -34C	11:30919
910	NTIS (US Sales Only), PC A02/MF A01	DE86701811	MN -34C	11:30914
918	NTIS (US Sales Only), PC A02/MF A01	DE86701812	MN -34C	11:30915
922	NTIS (US Sales Only), PC A03/MF A01	DE86701798	MN -34C	11:30929
923	NTIS (US Sales Only), PC A02/MF A01	DE86701816	MN -34C	11:30920

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
925	NTIS (US Sales Only), PC A03/MF A01	DE86701813	MN -34C	11:30916
927	NTIS (US Sales Only), PC A02/MF A01	DE86701810	MN -34C	11:30910
928	NTIS (US Sales Only), PC A02/MF A01	DE86701814	MN -34C	11:30917
931	NTIS (US Sales Only), PC A03/MF A01	DE86701817	MN -34C	11:30921
933	NTIS (US Sales Only), PC A05/MF A01	DE86701818	MN -34C	11:30922
AREAEE-				
273	NTIS (US Sales Only), PC A03/MF A01	DE86701795	MN -46	11:30507
279	NTIS (US Sales Only), PC A03/MF A01	DE86701796	MN -46	11:30944
BDX-				
613-3262	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE86010276	STD -4	11:30176
613-3476	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86010299	STD -38	11:30332
613-3477	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010298	STD -38	11:30391
BFR-R-				
109-1985	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751682	MN -95d	11:29989
114-1985	NTIS (US Sales Only), PC A06/MF A01; 1	DE86751683	MN -95d	11:29990
117-1985	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751684	MN -95d	11:29991
118-1985	NTIS (US Sales Only), PC A03/MF A01; 1	DE86751685	MN -95d	11:29992
BHARC-				
400/ 85/ 016-Vol.2	*See* NUREG/CR-4436-Vol.2	TI86008835	MN -80	11:29792
400/ 86/ 005	*See* PNL-5812	E 1.99: DE86009938	MN -13	11:31272
BMI/ONWI-				
585	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE86010255	STD -70	11:30738
587	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99: DE86010226	STD -70	11:30739
BNL-				
37407	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86005679	MN -80	11:29783
37685	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007133	MN -16	11:29452
37768	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86008007	MN -11	11:30608
37817	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009910	MN -28	11:30415
37836	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009939	MN -48	11:30658
37844	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009429	MN -28	11:30392
37846	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009442	MN -32	11:30960
37866	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE86009916	MN -94d	11:29459
37891	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009914	MN -34	11:30955
37898	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009917	MN -34A	11:30361
37899	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86009428	MN -37	11:30423
37930	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009944	MN -80	11:29824
37931	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86009919	MN -80	11:29784
37948	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009940	MN -34A	11:30422
37962	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009945	MN -34	11:30952
BNL-NUREG-				
37612	NTIS, PC A02/MF A01 - GPO	TI86006883	MN -78	11:29825
37615	NTIS, PC A02/MF A01 - GPO	TI86006880	MN -78	11:29826
37616	NTIS, PC A02/MF A01 - GPO	TI86006879	MN -78	11:29827
37617	NTIS, PC A02/MF A01 - GPO	TI86006881	MN -78	11:29793
37705	NTIS, PC A02/MF A01 - GPO	TI86007137	MN -78	11:29828
37869	NTIS, PC A02/MF A01; 1	TI86009430	MN -80	11:29829
37940	NTIS, PC A02/MF A01 - GPO	TI86009941	MN -78	11:29830
51643	*See* NUREG/CR-3137	TI86008600	MN -80	11:29850
51828-Vol.1	*See* NUREG/CR-4016-Vol.1	TI86003784	MN -80	11:29853
51969	*See* NUREG/CR-4557	TI86007668	MN -80	11:29803
BRE-IP-				
8/ 85	Publications Sales Office, Building Research Establishment, Garston, Watford WD2 7JR		ND -95d	11:29993
BSRIA-TN-				
6/ 85	Building Services Research and Information Association, Old Bracknell Lane West, Bracknell, Berks, RG12 4AH, price Pound 15.00		ND -95d	11:29994
7/ 85	Building Services Research and Information Association, Old Bracknell Lane West, Bracknell, Berks, RG12 4AH, price Pound 15.00		ND -95d	11:29995
CEA-CONF-				
7892	NTIS (US Sales Only), PC A02/MF A01	DE86751590	MN -25	11:30150
7954	NTIS (US Sales Only), PC A02/MF A01	DE86751591	MN -34C	11:30945
7958	NTIS (US Sales Only), PC A02/MF A01	DE86751597	MN -34B	11:30424
8028	NTIS (US Sales Only), PC A02/MF A01	DE86751365	MN -34D	11:30956
8032	NTIS (US Sales Only), PC A02/MF A01	DE86751342	MN -78	11:29756
8033	NTIS (US Sales Only), PC A02/MF A01	DE86751603	MN -34C	11:30924
8034	NTIS (US Sales Only), PC A02/MF A01	DE86751602	MN -34C	11:30925
8037	NTIS (US Sales Only), PC A02/MF A01	DE86751604	MN -34C	11:30926
8043	NTIS (US Sales Only), PC A02/MF A01	DE86751605	MN -34C	11:30892
8047	NTIS (US Sales Only), PC A03/MF A01	DE86751334	MN -25	11:30120
8049	NTIS (US Sales Only), PC A02/MF A01	DE86751349	MN -48	11:30659
8050	NTIS (US Sales Only), PC A02/MF A01	DE86751351	MN -48	11:30660
8052	NTIS (US Sales Only), PC A02/MF A01	DE86751367	MN -78	11:29757
8070	NTIS (US Sales Only), PC A06/MF A01	DE86751364	MN -34D	11:30849
8079	NTIS (US Sales Only), PC A02/MF A01	DE86751606	MN -25	11:30151
8100	NTIS (US Sales Only), PC A02/MF A01	DE86751336	MN -25	11:30072
8122	NTIS (US Sales Only), PC A03/MF A01	DE86751366	MN -80	11:29805
8123	NTIS (US Sales Only), PC A02/MF A01	DE86751335	MN -25	11:30152
8124	NTIS (US Sales Only), PC A02/MF A01	DE86751340	MN -25	11:30073
8126	NTIS (US Sales Only), PC A03/MF A01	DE86751370	MN -80	11:30074
8130	NTIS (US Sales Only), PC A02/MF A01	DE86751363	MN -78	11:29758
8131	NTIS (US Sales Only), PC A02/MF A01	DE86751369	MN -22	11:29289
8142	NTIS (US Sales Only), PC A02/MF A01	DE86751344	MN -80	11:29806

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
8147	NTIS (US Sales Only), PC A02/MF A01	DE86751338	MN -70	11:29316
8148	NTIS (US Sales Only), PC A03/MF A01	DE86751352	MN -23	11:29455
8149	NTIS (US Sales Only), PC A02/MF A01	DE86751343	MN -79	11:30376
8151	NTIS (US Sales Only), PC A02/MF A01	DE86751361	MN -78	11:30075
8153	NTIS (US Sales Only), PC A02/MF A01	DE86751362	MN -80	11:29816
8157	NTIS (US Sales Only), PC A02/MF A01	DE86751350	MN -48	11:30382
8164	NTIS (US Sales Only), PC A02/MF A01	DE86751337	MN -25	11:30076
8279	NTIS (US Sales Only), PC A02/MF A01; 1	DE86770098	MN -25	11:30077
CEA-N-				
2428	NTIS (US Sales Only), PC A07/MF A01	DE86751620	MN -34D	11:30879
2454	NTIS (US Sales Only), PC A09/MF A01	DE86751346	MN -25	11:30078
CEA-R-				
5314	NTIS (US Sales Only), PC A04/MF A01	DE86751345	MN -22	11:29290
5324	NTIS (US Sales Only), PC A12/MF A01	DE86751341	MN -80	11:29794
5326	NTIS (US Sales Only), PC A06/MF A01	DE86751637	MN -48	11:30690
CENBG-				
8502	NTIS (US Sales Only), PC A02/MF A01	DE86751589	MN -34C	11:30927
CEP-				
86/ 1	Curr. Energy Pat., 86: No. 1, vp(Jan 1986)			11:31274
CERN-EP-				
86-27	NTIS (US Sales Only), PC A02/MF A01	DE86901259	MN -34D	11:30850
CONF-8210345-	(Workshop on monopoles and proton decay, Kamioka, Gifu, Japan, 18-20 Oct 1982)			
	See KEK-83-12	DE86780434	MN -34D	11:30822
CONF-8210346-	(1. TRISTAN phase II workshop, Oho, Ibaraki, Japan, 12-14 Oct 1982)			
	See KEK-83-31	DE86780435	MN -34D	11:30831
CONF-8210347-	(Symposium on the protection of karst, Lipica, Italy, 7-10 Oct 1982)			
1	*See* ENEA-RT/PROT-83-23	DE86901005	MN -11	11:30610
CONF-8212109-	(Conference on new directions: the extrapolation of health risks from animals to man, Carmel, CA, USA, 1 Dec 1982)			
	See EPRI-EA-4447-Vol.1	TI86920253	ND -41	11:30716
CONF-8312135-	(Conference on new directions: the extrapolation of health risks from animals to man, San Diego, CA, USA, 1 Dec 1983)			
	See EPRI-EA-4447-Vol.2	TI86920254	ND -41	11:30717
CONF-840197-	(45. PTB seminar on problems of metering large gas volume flows in the high and low pressure range, Braunschweig, F.R. Germany, 24-25 Jan 1984)			
	See PTB-Me-58	DE86751708	MN -38	11:29253
CONF-840307-	(Waste management '84, Tucson, AZ, USA, 11-15 Mar 1984)			
53	*See* SAND-83-1982C	E 1.99: DE86009468	MN -70	11:29417
CONF-840422-	(International symposium on risks and benefits of energy systems, Juelich, F.R. Germany, 9-13 Apr 1984)			
4	*See* ENEA-RT/STUDI-85-1	DE86900964	MN -41	11:30527
CONF-8404293-	(Seminar on nuclear qualification, Cadarache, France, 25-26 Apr 1984)			
1	*See* FRADOC-2-1	DE86751317	MN -80	11:29799
CONF-8404301-	(PSF blind test workshop, Richland, WA, USA, 9-10 Apr 1984)			
Summ.	*See* HEDL-7467	TI86009423	MN -78	11:29750
CONF-8405400-	(International biogas workshop on community plants, Bremen, F.R. Germany, 1 May 1984)			
	NTIS (US Sales Only), PC A22/MF A01; 1	DE86751710	MN -61F	11:29461
CONF-840612-	(Air Pollution Control Association annual meeting, San Francisco, CA, USA, 25-28 Jun 1984)			
	Proc., Annu. Meet., Air Pollut. Control Assoc., 6: 16(1984)			11:29201
	Proc., Annu. Meet., Air Pollut. Control Assoc., 2: 13(1984)			11:29214
	Proc., Annu. Meet., Air Pollut. Control Assoc., 2: 21(1984)			11:30550
	Proc., Annu. Meet., Air Pollut. Control Assoc., 2: 16(1984)			11:30551
	Proc., Annu. Meet., Air Pollut. Control Assoc., 2: 21(1984)			11:30552
	Proc., Annu. Meet., Air Pollut. Control Assoc., 2: 31(1984)			11:30553
CONF-840623-	(International symposium on nuclear power plant outage experience, Karlsruhe, F.R. Germany, 18-22 Jun 1984)			
1	*See* FRADOC-3-1	DE86751316	MN -78	11:29771
CONF-840681-	(Total energy '84 exhibition and conference, Guangzhou, China, 12-18 Jun 1984)			
1	*See* FRADOC-1-1	DE86751360	MN -78	11:29767
CONF-8406328-	(4. Cracow School of Theoretical Physics conference, Zakopane, Poland, 1 Jun 1984)			
1	*See* RAL-85-056	TI86901218	ND -34D	11:30885
2	*See* RAL-85-057	TI86901224	ND -34D	11:30886

Report Number	*Availability Source*	*File Number*		*Distribution Category*	*Abstract Number*
CONF-8407145-	(19. annual seminar on theoretical physics, Cape Town, South Africa, 9-13 Jul 1984)				
Abstr.	*See* INIS-mf-10098		DE86780445	MN -25	11:30159
CONF-8407170-	(2. NAL symposium on aircraft computational aerodynamics, Tokyo, Japan, 5-6 Jul 1984)				
	See N-86-17267				11:30325
CONF-840802-	(ANS International topical meeting on fuel reprocessing and waste management, Jackson Hole, WY, USA, 26-29 Aug 1984)				
29	*See* AECL-8374		DE85900232	MN -70	11:29314
CONF-840873-	(US summer school on high energy particle accelerators, Batavia, IL, USA, 13-24 Aug 1984)				
5	*See* FNAL/C-86/30	E 1.99:	DE86009872	MN -28	11:30412
CONF-841049-	(5. AIC conference on the implementation and effectiveness of air infiltration standards in buildings, Reno, NV, USA, 1-4 Oct 1984)				
2	*See* LBL-17585	E 1.99:	DE86009360	MN -95d	11:30000
CONF-841093-	(Specialist meeting on steam generator problems, Stockholm, Sweden, 1-5 Oct 1984)				
4	*See* FRADOC-3-2		DE86751315	MN -78	11:29772
CONF-8410373-	(Workshop on hydrologic geochemical monitoring in the Long Valley caldera, Mammoth Lakes, CA, USA, 8-10 Oct 1984)				
	See LBL-20020	E 1.99:	DE86009343	MN -11	11:30747
CONF-8410401-	(12. meeting of experts: aerodynamic calculational methods for WECS, Copenhagen, Denmark, 29-30 Oct 1984)				
	See Juel-Spez-304		DE86751709	MN -60	11:29653
CONF-8410402-	(Expert meeting on LPG storage: hazards of LPG storage and transport, Essen, F.R. Germany, 29-30 Oct 1984)				
Exc.	*See* IKE-2-70		DE86751722	MN -92a	11:29243
CONF-841121-	(AIChE annual meeting, San Francisco, CA, USA, 25-29 Nov 1984)				
	American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017				11:29170
	American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017				11:29171
	American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017				11:29172
	American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017				11:29173
	American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017				11:29987
	American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017				11:30819
CONF-841157-	(Materials Research Society annual meeting, Boston, MA, USA, 26-29 Nov 1984)				
	Materials Research Society, 9800 McKnight Rd., Suite 327, Pittsburgh, PA 15237		TI85015352		11:29428
CONF-8411237-	(Technical committee and workshop on advanced light and heavy water reactor technology, Vienna, Austria, 26-29 Nov 1984)				
1	*See* FRADOC-1-3		DE86751358	MN -78	11:29769
CONF-8411243-	(Meeting on fuel assembly structure, Juelich, F.R. Germany, 15-16 Nov 1984)				
1	*See* FRADOC-2-6		DE86751318	MN -78	11:29770
CONF-8411253-	(Workshop on the state of forest decline in the Federal Republic of Germany, Duesseldorf, F.R. Germany, 26 Nov 1984)				
Vol.1	NTIS (US Sales Only), PC A09/MF A01; 1		DE86751717	MN -11	11:30704
CONF-8411254-	(Workshop on secondary-side stress corrosion cracking and intergranular corrosion of PWR steam generator tubing, Palo Alto, CA, USA, 12-14 Nov 1984)				
Summs.	*See* EPRI-NP-4478		TI86920242	ND -78	11:29765
CONF-850103-	(2. symposium on space nuclear power systems, Albuquerque, NM, USA, 14-16 Jan 1985)				
14	*See* BNL-37407	E 1.99:	DE86005679	MN -80	11:29783
15	*See* N-86-16258				11:29785
CONF-850187-	(International symposium on computer assisted radiology (CAR 85), Berlin, F.R. Germany, 26-29 Jan 1985)				
1	*See* CEA-CONF-8049		DE86751349	MN -48	11:30659
CONF-850254-	(SAE international congress and exhibition, Detroit, MI, USA, 27 Feb-2 Mar 1985)				
6	*See* LBL-18914		TI86009909	ND -96	11:30033
CONF-8502101-	(8. biennial session on nuclear physics, Aussois, France, 4-8 Feb 1985)				
10	*See* CENBG-8502		DE86751589	MN -34C	11:30927
CONF-8502124-	(Technical seminar on pollutant deposition, Braunschweig, F.R. Germany, 6-7 Feb 1985)				
	NTIS (US Sales Only), PC A12/MF A01; 1		DE86751719	MN -95e	11:30023

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
CONF-850306-	(Solar energy conference--1985, Knoxville, TN, USA, 25-29 Mar 1985)			
3	*See* LBL-18306	E 1.99: DE86009904	MN -95d	11:30001
CONF-850310-	(6. topical meeting on the technology of fusion energy, San Francisco, CA, USA, 3-7 Mar 1985)			
	Fusion Technol., 8: No. 1, 657-663(Jul 1985)			11:30995
	Fusion Technol., 8: No. 1, 668-673(Jul 1985)			11:30996
	Fusion Technol., 8: No. 1, 674-679(Jul 1985)			11:30997
	Fusion Technol., 8: No. 1, 1511-1524(Jul 1985)			11:30998
	Fusion Technol., 8: No. 1, 1717-1721(Jul 1985)			11:30999
	Fusion Technol., 8: No. 1, 1795-1800(Jul 1985)			11:31000
	Fusion Technol., 8: No. 1, 1020-1025(Jul 1985)			11:31001
	Fusion Technol., 8: No. 1, 1402-1407(Jul 1985)			11:31002
	Fusion Technol., 8: No. 1, 1789-1794(Jul 1985)			11:31003
	Fusion Technol., 8: No. 1, 1807-1814(Jul 1985)			11:31004
	Fusion Technol., 8: No. 1, 664-667(Jul 1985)			11:31005
	Fusion Technol., 8: No. 1, 245-250(Jul 1985)			11:31006
	Fusion Technol., 8: No. 1, 291-2[illegible](Jul 1985)			11:31108
	Fusion Technol., 8: No. 1, 285-29[illegible]ul 1985)			11:31109
	Fusion Technol., 8: No. 1, 257-263(Jul 1985)			11:31110
	Fusion Technol., 8: No. 1, 276-284(Jul 1985)			11:31111
	Fusion Technol., 8: No. 1, 270-275(Jul 1985)			11:31112
	Fusion Technol., 8: No. 1, 264-269(Jul 1985)			11:31113
	Fusion Technol., 8: No. 1, 314-317(Jul 1985)			11:31114
	Fusion Technol., 8: No. 1, 332-337(Jul 1985)			11:31115
	Fusion Technol., 8: No. 1, 356-361(Jul 1985)			11:31116
	Fusion Technol., 8: No. 1, 350-355(Jul 1985)			11:31117
	Fusion Technol., 8: No. 1, 427-432(Jul 1985)			11:31118
	Fusion Technol., 8: No. 1, 441-449(Jul 1985)			11:31119
	Fusion Technol., 8: No. 1, 459-464(Jul 1985)			11:31120
	Fusion Technol., 8: No. 1, 707-716(Jul 1985)			11:31121
	Fusion Technol., 8: No. 1, 747-758(Jul 1985)			11:31122
	Fusion Technol., 8: No. 1, 1351-1358(Jul 1985)			11:31123
	Fusion Technol., 8: No. 1, 1423-1430(Jul 1985)			11:31124
	Fusion Technol., 8: No. 1, 1552-1570(Jul 1985)			11:31125
	Fusion Technol., 8: No. 1, 1297-1300(Jul 1985)			11:31126
	Fusion Technol., 8: No. 1, 1301-1305(Jul 1985)			11:31127
	Fusion Technol., 8: No. 1, 1306-1311(Jul 1985)			11:31128
	Fusion Technol., 8: No. 1, 1312-1317(Jul 1985)			11:31129
	Fusion Technol., 8: No. 1, 1324-1329(Jul 1985)			11:31130
	Fusion Technol., 8: No. 1, 308-313(Jul 1985)			11:31131
	Fusion Technol., 8: No. 1, 511-524(Jul 1985)			11:31132
	Fusion Technol., 8: No. 1, 483-490(Jul 1985)			11:31133
	Fusion Technol., 8: No. 1, 525-530(Jul 1985)			11:31134
	Fusion Technol., 8: No. 1, 565-572(Jul 1985)			11:31135
	Fusion Technol., 8: No. 1, 586-591(Jul 1985)			11:31136
	Fusion Technol., 8: No. 1, 630-636(Jul 1985)			11:31137
	Fusion Technol., 8: No. 1, 779-790(Jul 1985)			11:31138
	Fusion Technol., 8: No. 1, 791-799(Jul 1985)			11:31139
	Fusion Technol., 8: No. 1, 953-957(Jul 1985)			11:31140
	Fusion Technol., 8: No. 1, 875-880(Jul 1985)			11:31141
	Fusion Technol., 8: No. 1, 871-874(Jul 1985)			11:31142
	Fusion Technol., 8: No. 1, 465-473(Jul 1985)			11:31143
	Fusion Technol., 8: No. 1, 887-890(Jul 1985)			11:31144
	Fusion Technol., 8: No. 1, 904-910(Jul 1985)			11:31145
	Fusion Technol., 8: No. 1, 927-930(Jul 1985)			11:31146
	Fusion Technol., 8: No. 1, 1043-1048(Jul 1985)			11:31147
	Fusion Technol., 8: No. 1, 1037-1042(Jul 1985)			11:31148
	Fusion Technol., 8: No. 1, 1012-1019(Jul 1985)			11:31149
	Fusion Technol., 8: No. 1, 1001-1005(Jul 1985)			11:31150
	Fusion Technol., 8: No. 1, 980-985(Jul 1985)			11:31151
	Fusion Technol., 8: No. 1, 962-967(Jul 1985)			11:31152
	Fusion Technol., 8: No. 1, 1259-1268(Jul 1985)			11:31153
	Fusion Technol., 8: No. 1, 1165-1173(Jul 1985)			11:31154
	Fusion Technol., 8: No. 1, 1330-1338(Jul 1985)			11:31155
	Fusion Technol., 8: No. 1, 1443-1448(Jul 1985)			11:31156
	Fusion Technol., 8: No. 1, 1535-1541(Jul 1985)			11:31157
	Fusion Technol., 8: No. 1, 1101-1108(Jul 1985)			11:31158
	Fusion Technol., 8: No. 1, 1838-1843(Jul 1985)			11:31159
	Fusion Technol., 8: No. 1, 1909-1914(Jul 1985)			11:31160
	Fusion Technol., 8: No. 1, 1766-1771(Jul 1985)			11:31161
	Fusion Technol., 8: No. 1, 1826-1831(Jul 1985)			11:31162
	Fusion Technol., 8: No. 1, 1275-1280(Jul 1985)			11:31163
	Fusion Technol., 8: No. 2, 227-232(Jul 1985)			11:31164
	Fusion Technol., 8: No. 1, 327-331(Jul 1985)			11:31165
	Fusion Technol., 8: No. 1, 344-349(Jul 1985)			11:31166
	Fusion Technol., 8: No. 1, 637-640(Jul 1985)			11:31167
	Fusion Technol., 8: No. 1, 685-692(Jul 1985)			11:31168
	Fusion Technol., 8: No. 1, 829-837(Jul 1985)			11:31169
	Fusion Technol., 8: No. 1, 817-822(Jul 1985)			11:31170
	Fusion Technol., 8: No. 1, 807-816(Jul 1985)			11:31171
	Fusion Technol., 8: No. 1, 838-842(Jul 1985)			11:31172
	Fusion Technol., 8: No. 1, 1291-1296(Jul 1985)			11:31173
	Fusion Technol., 8: No. 1, 1503-1510(Jul 1985)			11:31174

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
	Fusion Technol., 8: No. 1, 1590-1595(Jul 1985)			11:31175
	Fusion Technol., 8: No. 1, 1616-1624(Jul 1985)			11:31176
	Fusion Technol., 8: No. 1, 1571-1580(Jul 1985)			11:31177
	Fusion Technol., 8: No. 1, 1581-1589(Jul 1985)			11:31178
	Fusion Technol., 8: No. 1, 1606-1612(Jul 1985)			11:31179
	Fusion Technol., 8: No. 1, 1659-1663(Jul 1985)			11:31180
	Fusion Technol., 8: No. 1, 1664-1669(Jul 1985)			11:31181
	Fusion Technol., 8: No. 1, 1670-1675(Jul 1985)			11:31182
	Fusion Technol., 8: No. 1, 1682-1687(Jul 1985)			11:31183
	Fusion Technol., 8: No. 1, 1703-1707(Jul 1985)			11:31184
	Fusion Technol., 8: No. 1, 1708-1716(Jul 1985)			11:31185
	Fusion Technol., 8: No. 1, 1753-1759(Jul 1985)			11:31186
	Fusion Technol., 8: No. 1, 1801-1806(Jul 1985)			11:31187
	Fusion Technol., 8: No. 1, 1318-1323(Jul 1985)			11:31188
	Fusion Technol., 8: No. 1, 1844-1849(Jul 1985)			11:31189
	Fusion Technol., 8: No. 1, 1281-1283(Jul 1985)			11:31190
	Fusion Technol., 8: No. 1, 392-399(Jul 1985)			11:31191
	Fusion Technol., 8: No. 1, 381-386(Jul 1985)			11:31192
	Fusion Technol., 8: No. 1, 411-419(Jul 1985)			11:31193
	Fusion Technol., 8: No. 1, 450-458(Jul 1985)			11:31194
	Fusion Technol., 8: No. 1, 553-558(Jul 1985)			11:31195
	Fusion Technol., 8: No. 1, 693-706(Jul 1985)			11:31196
	Fusion Technol., 8: No. 1, 727-730(Jul 1985)			11:31197
	Fusion Technol., 8: No. 1, 800-806(Jul 1985)			11:31198
	Fusion Technol., 8: No. 1, 400-404(Jul 1985)			11:31199
	Fusion Technol., 8: No. 1, 387-391(Jul 1985)			11:31200
	Fusion Technol., 8: No. 1, 891-894(Jul 1985)			11:31201
	Fusion Technol., 8: No. 1, 895-897(Jul 1985)			11:31202
	Fusion Technol., 8: No. 1, 911-917(Jul 1985)			11:31203
	Fusion Technol., 8: No. 1, 918-926(Jul 1985)			11:31204
	Fusion Technol., 8: No. 1, 1241-1246(Jul 1985)			11:31205
	Fusion Technol., 8: No. 1, 1247-1252(Jul 1985)			11:31206
	Fusion Technol., 8: No. 1, 1648-1702(Jul 1985)			11:31207
	Fusion Technol., 8: No. 1, 1722-1728(Jul 1985)			11:31208
	Fusion Technol., 8: No. 1, 1265-1268(Jul 1985)			11:31209
	Fusion Technol., 8: No. 1, 1208-1213(Jul 1985)			11:31210
	Fusion Technol., 8: No. 1, 1774-1782(Jul 1985)			11:31211
	Fusion Technol., 8: No. 1, 1367-1375(Jul 1985)			11:31212
	Fusion Technol., 8: No. 1, 1625-1630(Jul 1985)			11:31213
	Fusion Technol., 8: No. 1, 1631-1636(Jul 1985)			11:31214
	Fusion Technol., 8: No. 1, 1637-1642(Jul 1985)			11:31215
	Fusion Technol., 8: No. 1, 1832-1837(Jul 1985)			11:31216
	Fusion Technol., 8: No. 1, 189-200(Jul 1985)			11:31217
	Fusion Technol., 8: No. 1, 433-440(Jul 1985)			11:31218
	Fusion Technol., 8: No. 1, 645-650(Jul 1985)			11:31219
	Fusion Technol., 8: No. 1, 1032-1036(Jul 1985)			11:31220
	Fusion Technol., 8: No. 1, 1376-1384(Jul 1985)			11:31221
	Fusion Technol., 8: No. 1, 1901-1908(Jul 1985)			11:31222
	Fusion Technol., 8: No. 1, 1204-1207(Jul 1985)			11:31223
	Fusion Technol., 8: No. 1, 1214-1219(Jul 1985)			11:31224
	Fusion Technol., 8: No. 1, 1191-1197(Jul 1985)			11:31225
	Fusion Technol., 8: No. 1, 1198-1203(Jul 1985)			11:31226
	Fusion Technol., 8: No. 1, 1220-1228(Jul 1985)			11:31227
	Fusion Technol., 8: No. 1, 1861-1867(Jul 1985)			11:31228
	Fusion Technol., 8: No. 1, 1868-1871(Jul 1985)			11:31229
	Fusion Technol., 8: No. 1, 1872-1877(Jul 1985)			11:31230
	Fusion Technol., 8: No. 1, 1820-1825(Jul 1985)			11:31231
	Fusion Technol., 8: No. 1, 318-326(Jul 1985)			11:31232
	Fusion Technol., 8: No. 1, 559-564(Jul 1985)			11:31233
	Fusion Technol., 8: No. 1, 937-946(Jul 1985)			11:31234
	Fusion Technol., 8: No. 1, 1253-1258(Jul 1985)			11:31235
	Fusion Technol., 8: No. 1, 1269-1274(Jul 1985)			11:31236
	Fusion Technol., 8: No. 1, 1772-1773(Jul 1985)			11:31237
	Fusion Technol., 8: No. 1, 1174-1183(Jul 1985)			11:31238
	Fusion Technol., 8: No. 1, 1385-1391(Jul 1985)			11:31239
	Fusion Technol., 8: No. 1, 1392-1395(Jul 1985)			11:31240
	Fusion Technol., 8: No. 1, 1408-1414(Jul 1985)			11:31241
	Fusion Technol., 8: No. 1, 1449-1453(Jul 1985)			11:31242
	Fusion Technol., 8: No. 1, 1484-1490(Jul 1985)			11:31243
	Fusion Technol., 8: No. 1, 1542-1551(Jul 1985)			11:31244
	Fusion Technol., 8: No. 1, 1091-1100(Jul 1985)			11:31245
	Fusion Technol., 8: No. 1, 1109-1114(Jul 1985)			11:31246
	Fusion Technol., 8: No. 1, 1115-1123(Jul 1985)			11:31247
	Fusion Technol., 8: No. 1, 1152-1156(Jul 1985)			11:31248
	Fusion Technol., 8: No. 1, 1157-1164(Jul 1985)			11:31249
	Fusion Technol., 8: No. 1, 1235-1240(Jul 1985)			11:31250
	Fusion Technol., 8: No. 1, 1729-1734(Jul 1985)			11:31251
	Fusion Technol., 8: No. 1, 1735-1741(Jul 1985)			11:31252
	Fusion Technol., 8: No. 1, 1783-1788(Jul 1985)			11:31253
	Fusion Technol., 8: No. 1, 1284-1290(Jul 1985)			11:31254
CONF-850314- Vol.2	(Waste management '85, Tucson, AZ, USA, 24-28 Mar 1985) Arizona Board of Regents, Tucson, AZ	TI85015357	ND -70	11:29317

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
CONF-850373-	(International rare earth conference on materials and chemistry, Zurich, Switzerland, 4-8 Mar 1985)				
	J. Less-Common Met., 111: 251-256(Sep 1985)				11:30111
CONF-850375-	(20. Recontre de Moriond, Les Arcs, France, 10-23 Mar 1985)				
21	*See* CEA-CONF-8028		DE86751365	MN -34D	11:30956
CONF-8503146-	(Topical seminar on few and many quark systems, San Miniato, Italy, 25-29 Mar 1985)				
5	*See* SLAC-PUB-3845	E 1.99:	DE86009782	MN -34D	11:30845
CONF-850405-	(2. national topical meeting on tritium technology in fission, fusion and isotopic applications, Dayton, OH, USA, 30 Apr-2 May 1985)				
	Fusion Technol., 8: No. 2, 2467-2472(Sep 1985)				11:31101
	Fusion Technol., 8: No. 2, 2444-2454(Sep 1985)				11:31102
CONF-8504101-	(18. oil shale symposium, Grand Junction, CO, USA, 22-24 Apr 1985)				
	Colorado School of Mines Press, Publications Center, Golden, CO 80401				11:29254
CONF-8504110-	(Joint Los Alamos/CEA meeting on Monte Carlo methods, Cadarache, France, 22-26 Apr 1985)				
22	*See* CEA-CONF-7954		DE86751591	MN -34C	11:30945
CONF-8504156-	(1. symposium on underground physics, St. Vincent, Italy, 25-28 Apr 1985)				
2	*See* CEA-CONF-7958		DE86751597	MN -34B	11:30424
CONF-8504205-	(IAEA/NPPCI specialists meeting on new instrumentation of water cooled reactors, Dresden, F.R. Germany, 23-24 Apr 1985)				
1	*See* CEA-CONF-8032		DE86751342	MN -78	11:29756
CONF-8504212-	(Insulating films on semiconductors congress (INFO 85), Toulouse, France, 16-18 Apr 1985)				
1	*See* CEA-CONF-7892		DE86751590	MN -25	11:30150
CONF-8504213-	(12. international winter meeting on fundamental physics, Cuenca, Spain, 22-27 Apr 1985)				
1	*See* LAL-85-29		DE86751601	MN -34D	11:30873
CONF-8504230-	(Space photovoltaic research and technology conference: high efficiency, space environment, and array technology, Cleveland, OH, USA, 30 Apr-2 May 1985)				
	See N-86-17839				11:29516
CONF-850505-	(Joint symposium on stationary combustion NO/sub x/ control, Boston, MA, USA, 6-9 May 1985)				
	See ICTIS/M-0179				11:29229
CONF-850507-	(International conference on nuclear data for basic and applied science, Santa Fe, NM, USA, 13-17 May 1985)				
58	*See* CEA-CONF-8034		DE86751602	MN -34C	11:30925
59	*See* CEA-CONF-8033		DE86751603	MN -34C	11:30924
60	*See* CEA-CONF-8037		DE86751604	MN -34C	11:30926
CONF-850539-	(RefCom: a briefing for industry (RefCom is an experimental facility for anaerobic digestion of sludge and municipal waste), Ft. Lauderdale, FL, USA, 22-24 May 1985)				
	See ANL/CNSV-TM-174	E 1.99:	DE86009668	MN -61E	11:29460
CONF-8505148-	(National conference on perspectives on nonpoint source pollution, Kansas City, MO, USA, 19-22 May 1985)				
	See EPA-440/5-85-001				11:29188
CONF-8505229-	(New particles conference, Madison, WI, USA, 8-11 May 1985)				
2	*See* SLAC-PUB-3904	E 1.99:	DE86009199	MN -34D	11:30846
CONF-8505241-	(Technical committee on reactor safety research conference, Vienna, Italy, 29-31 May 1985)				
1	*See* CEA-CONF-8052		DE86751367	MN -78	11:29757
CONF-8505251-	(4. Rutherford Appleton Laboratory workshop on astronomy and astrophysics, Abingdon, UK, 20-22 May 1985)				
	See RAL-85-086		DE86701774	MN -34B	11:30790
CONF-8505273-	(2. International Atomic Energy Agency specialists' meeting on subcritical crack growth, Sendai, Japan, 15-17 May 1985)				
Vol.1	*See* NUREG/CP-0067-Vol.1		TI86901353	MN -78	11:29751
Vol.2	*See* NUREG/CP-0067-Vol.2		TI86901354	MN -78	11:29752
CONF-850606-	(American Society of Heating, Refrigerating and Air-Conditioning Engineers' semiannual meeting, Honolulu, HI, USA, 23-27 Jun 1985)				
17	*See* LBL-18732	E 1.99:	DE86009896	MN -95d	11:30002
CONF-850634-	(International school for intermediate energy nuclear physics, Veronna, Italy, 20-30 Jun 1985)				
3	*See* CEA-CONF-8043		DE86751605	MN -34C	11:30892
CONF-850638-	(CAR '85 - computer assisted radiology, Berlin, F.R. Germany, 26-29 Jun 1985)				
1	*See* CEA-CONF-8050		DE86751351	MN -48	11:30660

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
CONF-850656-	(16. IEEE annual PESC conference, Toulouse, France, 24-28 Jun 1985)			
	See ESA-SP-30			11:29506
CONF-8506104-	(26. Society of Professional Well Log Analysts annual logging symposium, Dallas, TX, USA, 17-20 Jun 1985)			
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86008249	MN -70	11:30746
CONF-8506173-	(Workshop on polarized beams at the SSC, Ann Arbor, MI, USA, 10-15 Jun 1985)			
8	*See* LAL-RT-85-08	DE86751353	MN -28	11:30420
9	*See* LAL-RT-85-09	DE86751354	MN -28	11:30421
CONF-8506194-	(International symposium on multiparticle dynamics, Kiryat Anavim, Israel, 9-14 Jun 1985)			
10	*See* LAL-85-32	DE86751357	MN -34D	11:30838
CONF-8506213-	(State-of-the-art symposium on degradation of materials due to acid rain, Arlington, VA, USA, 17-19 Jun 1985)			
2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86008001	MN -11	11:30526
CONF-8506217-	(CRDC conference, Aberdeen, MD, USA, 17-21 Jun 1985)			
2	*See* LA-UR-85-3347	E 1.99: DE86000810	MN -34	11:30948
CONF-8506242-	(Cambridge workshop on supersymmetry and its applications, Cambridge, UK, 23 Jun-13 Jul 1985)			
2	*See* ICTP-IC-85/253	DE86901309	MN -34D	11:30881
CONF-8506249-	(Congress on shaping processes, Paris, France, 25 Jun 1985)			
1	*See* CEA-CONF-8047	DE86751334	MN -25	11:30120
CONF-8506262-	(Summer school on theory of nuclear structure and reactions, La Rabida, Spain, 23 Jun-6 Jul 1985)			
1-Summ.	*See* ISN-85-30	DE86751618	MN -34C	11:30936
CONF-850721-	(International Europhysics conference on high energy physics, Bari, Italy, 18-24 Jul 1985)			
21	*See* LAL-85-27	DE86751355	MN -34D	11:30837
23	*See* RAL-85-077	DE86701785	MN -34D	11:30875
CONF-850768-	(SLAC summer institute on particle physics, Stanford, CA, USA, 23 Jul-3 Aug 1985)			
6	*See* RAL-85-076	DE86701792	MN -34D	11:30843
CONF-850785-	(5. international conference on physics in collision, Autun, France, 3-5 Jul 1985)			
10	*See* LAL-85-37	DE86751356	MN -34D	11:30840
CONF-850814-	(Cryogenic engineering conference and international cryogenic materials conference, Boston, MA, USA, 12-16 Aug 1985)			
39	*See* LBL-19406	E 1.99: DE86009922	MN -25	11:30342
CONF-850823-	(7. international conference on the strength of metals and alloys, Montreal, Canada, 12-16 Aug 1985)			
6	*See* CEA-CONF-8100	DE86751336	MN -25	11:30072
CONF-850836-	(American Institute of Chemical Engineers national meeting, Seattle, WA, USA, 25-28 Aug 1985)			
11	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86008969	MN -4	11:30308
CONF-8508154-	(International seminar on nuclear war, Erice, Italy, 19-24 Aug 1985)			
5	*See* UCRL-94428	E 1.99: DE86009392	MN -11	11:30697
CONF-8508166-	(IUTAM symposium on inelastic behavior of plates and shells, Rio de Janeiro, Brazil, 5-9 Aug 1985)			
1	*See* CEA-CONF-8079	DE86751606	MN -25	11:30151
CONF-850921-	(5. international conference on hypernuclear and kaon physics, Upton, NY, USA, 9-13 Sep 1985)			
12	*See* DOE/ER/03244-121	E 1.99: DE86009675	MN -34C	11:30896
CONF-850928-	(International symposium on contribution of materials investigation to the resolution of problems encountered in PWR plants, Chinon, France, 3-5 Sep 1985)			
2	*See* CEA-CONF-8130	DE86751363	MN -78	11:29758
CONF-850932-	(Seminar on applied research and service activities for research reactor operations, Copenhagen, Denmark, 9-13 Sep 1985)			
2	*See* CEA-CONF-8153	DE86751362	MN -80	11:29816
CONF-850944-	(Muskoka conference: international symposium on acidic precipitation, Toronto, Ontario, Canada, 15-20 Sep 1985)			
5	*See* BNL-37768	E 1.99: DE86008007	MN -11	11:30608
CONF-850947-	(International meeting on solvent extraction and ion exchange in the nuclear fuel cycle, Harwell, UK, 3-6 Sep 1985)			
4	*See* CEA-CONF-8131	DE86751369	MN -22	11:29289
CONF-850995-	(Materials Research Society international symposium, Stockholm, Sweden, 9-12 Sep 1985)			
	Publications Department, Materials Research Society, 9800 McKnight Rd., Suite 327, Pittsburgh, PA 15237	TI86009648	BK -70	11:29420
CONF-8509121-	(7. annual DOE LLWMP participants information meeting, Las Vegas, NV, USA, 10-13 Sep 1985)			
	NTIS, PC A99/MF A01; 1 (GPO Dep.)	E 1.99: DE86010152	STD -70B	11:29399

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
CONF-8509147-	(ACTINIDES '85, Aix-en-Provence, France, 1-6 Sep 1985)			
15	*See* CEA-CONF-8123	DE86751335	MN -25	11:30152
16	*See* CEA-CONF-8124	DE86751340	MN -25	11:30073
17	*See* CEA-CONF-8122	DE86751366	MN -80	11:29805
18	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009458	MN -4	11:30190
CONF-8509165-	(International symposium on refined flow modeling and turbulence measurements, Iowa City, IA, USA, 16 Sep 1985)			
3	*See* CEA-CONF-8149	DE86751343	MN -79	11:30376
CONF-8509235-	(2. international conference on radiation technique, Essen, F.R. Germany, 17-18 Sep 1985)			
2	*See* CEA-CONF-8151	DE86751361	MN -78	11:30075
CONF-8509238-	(Franco-Soviet seminar on advanced cladding materials, Moscow, USSR, 30 Sep-7 Oct 1985)			
1	*See* CEA-CONF-8164	DE86751337	MN -25	11:30076
CONF-8509239-	(Workshop on carbon steel corrosion allowance containers for disposal of HLW, Zurich, Switzerland, 16-17 Sep 1985)			
2	*See* CEA-CONF-8147	DE86751338	MN -70	11:29316
CONF-8509240-	(10. international symposium on mass spectrometry, Swansea, UK, 8-13 Sep 1985)			
1	*See* CEA-CONF-8142	DE86751344	MN -80	11:29806
CONF-8509241-	(1. European conference on composite materials (ECCMI-1), Bordeaux, France, 25-27 Sep 1985)			
1	*See* CEA-CONF-8157	DE86751350	MN -48	11:30382
CONF-8509242-	(Seminar on food irradiation, Seoul, Korea, 16-17 Sep 1985)			
1	*See* CEA-CONF-8148	DE86751352	MN -23	11:29455
CONF-8509244-	(Annual meeting of the International Institute of Welding, Strasbourg, France, 2-6 Sep 1985)			
1	*See* CEA-CONF-8126	DE86751370	MN -80	11:30074
CONF-8509246-	(Advanced research workshop: Clifford algebras and their applications to mathematical physics, Canterbury, England, 15-27 Sep 1985)			
1-Rev.1	*See* UCRL-92562-Rev.1	E 1.99: DE86009716	MN -32	11:30959
CONF-8509280-	(2. Hellenic school on elementary particle physics, Corfu, Greece, 1-20 Sep 1985)			
1	*See* SLAC-PUB-3902	E 1.99: DE86009198	MN -34D	11:30887
2	*See* CERN-EP-86-27	DE86901259	MN -34D	11:30850
CONF-8509284-	(1. Torino meeting on superunification and extra dimensions, Torino, Italy, 23-28 Sep 1985)			
1	*See* ICTP-IC-85/284	DE86901302	MN -34D	11:30882
CONF-8509285-	(BWEA-Department of Energy workshop on R and D needs in wind energy, Harwell, UK, 10 Sep 1985)			
	See ETSU-R-36	DE86751892	MN -60	11:29651
CONF-851009-	(IEEE nuclear science symposium, San Francisco, CA, USA, 23-25 Oct 1985)			
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30427
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30428
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30429
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30430
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30431
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30432
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30433
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30434
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30435
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30436
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30437
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30438
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30439
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30440
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30441
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30442
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30443
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30444
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30445
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30446
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30447
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30448
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30449
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30450
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30451
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30452
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30453
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30454
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30455
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30456
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30457
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30458
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30459
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30460
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30461
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)			11:30462

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30463
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30464
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30465
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30466
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30467
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30468
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30469
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30470
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30471
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30472
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30473
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30474
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30475
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30476
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30477
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30478
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30494
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30665
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30666
	IEEE Trans. Nucl. Sci., NS-33: No. 1, vp(Feb 1986)				11:30667
CONF-851052-	(17. annual symposium on optical materials for high-power lasers, Boulder, CO, USA, 28-30 Oct 1985)				
6	*See* LA-UR-86-1202	E 1.99:	DE86010173	MN -25	11:30160
CONF-8510277-	(VGB congress on power plants, Hague, Netherlands, 9-12 Oct 1985)				
1	*See* FRADOC-1-2		DE86751359	MN -78	11:29768
CONF-8510286-	(26. Brazilian congress on chemistry, Fortaleza, CE, Brazil, 6-11 Oct 1985)				
Abstr.	*See* INIS-BR-456		DE86701820	MN -4	11:30179
CONF-851104-	(Fundamental aspects of fracture, Gatlinburg, TN, USA, 4-7 Nov 1985)				
2	*See* HEDL-SA-3291	E 1.99:	DE86009415	MN -25	11:30096
CONF-8511137-	(Workshop on the investigation of fundamental interactions with cold neutrons, Gaithersburg, MD, USA, 14-15 Nov 1985)				
5	*See* DOE/ER/40157-3	E 1.99:	DE86009672	MN -34C	11:30947
CONF-8511179-	(North American Lake Management Society meeting, Lake Geneva, WI, USA, 13-16 Nov 1985)				
1	NTIS, PC A02; 3		DE86008885	MN -11	11:30578
CONF-8511184-	(Symposium on advanced coal power technology, Malmoe, Sweden, 6-7 Nov 1985)				
	See ICTIS/M-0193				11:29166
	See ICTIS/M-0187				11:29196
	See ICTIS/M-0189				11:29197
	See ICTIS/M-0186				11:29220
	See ICTIS/M-0190				11:29221
	See ICTIS/M-0191				11:29222
	See ICTIS/M-0192				11:29223
	See ICTIS/M-0188				11:29678
	See ICTIS/M-0194				11:29679
	See ICTIS/M-0195				11:29680
CONF-8511186-	(7. European congress on corrosion, Nice, France, 19-21 Nov 1985)				
1	*See* CEA-CONF-8279		DE86770098	MN -25	11:30077
CONF-851202-	(DOE-ORNL-ASHRAE-BTECC conference on thermal performance of the exterior envelopes of buildings-III, Clearwater Beach, FL, USA, 2-5 Dec 1985)				
11	*See* LBL-20348	E 1.99:	DE86009947	MN -95d	11:30003
CONF-851203-	(International conference and exhibition on fatigue, corrosion cracking, fracture mechanic and failure analysis, Salt Lake City, UT, USA, 2-6 Dec 1985)				
5	*See* EGG-M-05585	E 1.99:	DE86007635	MN -38	11:30383
CONF-851217-	(Materials Research Society meeting, Boston, MA, USA, 2-7 Dec 1985)				
64	*See* N-86-17472				11:30123
CONF-860102-	(3. symposium on space nuclear power systems, Albuquerque, NM, USA, 13-16 Jan 1986)				
6	*See* SAND-85-1840C	E 1.99:	DE86005438	MN -38	11:30346
8	*See* BNL-37930	E 1.99:	DE86009944	MN -80	11:29824
9	*See* N-86-16334				11:29786
CONF-860106-	(ASHRAE semi-annual meeting, San Francisco, CA, USA, 19-22 Jan 1986)				
3	*See* LBL-20950	E 1.99:	DE86009394	MN -95d	11:30004
CONF-860117-	(Los Angeles symposium and exhibition on optical and electro-optical engineering, Los Angeles, CA, USA, 19-24 Jan 1986)				
8	*See* UCRL-93950	E 1.99:	DE86009407	MN -21	11:31083
9	*See* LA-UR-86-996	E 1.99:	DE86008748	MN -38	11:30362
CONF-860119-	(Society for Computer Simulation (SCS) multiconference, San Diego, CA, USA, 23-25 Jan 1986)				
5	*See* N-86-16221				11:30035

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
CONF-860126-	(International workshop on polarized sources and targets, Montana, Switzerland, 13-17 Jan 1986)				
8	*See* TRI-PP-86-5		DE86901242	MN -28	11:30418
9	*See* TRI-PP-86-2		DE86901244	MN -28	11:30416
10	*See* TRI-PP-86-3		DE86901243	MN -28	11:30417
CONF-860146-	(Radiobioassay and internal dosimetry workshop, Albuquerque, NM, USA, 20 Jan 1986)				
8	*See* UCRL-93776	E 1.99:	DE86009693	MN -41	11:30951
CONF-860152-	(10. annual conference on composites and advanced ceramic materials, Cocoa Beach, FL, USA, 19-24 Jan 1986)				
3	*See* N-86-16599				11:30122
CONF-860155-	(Workshop on neutron capture therapy, New York, NY, USA, 22-23 Jan 1986)				
2	*See* BNL-37836	E 1.99:	DE86009939	MN -48	11:30658
CONF-860161-	(Geographic information systems for environmental protection, Las Vegas, NV, USA, 22-23 Jan 1986)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008220	MN -11	11:30609
CONF-860163-	(Workshop on analysis of trace metals in rain, Toronto, Canada, 29-30 Jan 1986)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86008540	MN -11	11:30524
CONF-860165-	(Geology and geochemistry of abyssal plains symposium, London, UK, 1 Jan 1986)				
1	*See* SAND-85-2124C	E 1.99:	DE86009024	MN -11	11:30750
CONF-860166-	(Workshop on fundamental muon physics: atoms, nuclei, and particles, Los Alamos, NM, USA, 20-22 Jan 1986)				
3	*See* LBL-21174	E 1.99:	DE86009921	MN -20g	11:31077
CONF-860167-	(Recontres de Moriond workshop on massive neutrinos in particle physics and astrophysics, Tignes, Savoie, France, 25 Jan-1 Feb 1986)				
3	*See* LBL-21126	E 1.99:	DE86009926	MN -34B	11:30783
4	*See* LA-UR-86-1233	E 1.99:	DE86010176	MN -34D	11:30872
CONF-860168-	(Workshop on observable standard model physics at the SSC, Los Angeles, CA, USA, 15-24 Jan 1986)				
1	*See* ANL-HEP-CP-86-19	E 1.99:	DE86009181	MN -34D	11:30848
CONF-860170-	(Ignition Technical Oversight Committee meeting, Austin, TX, USA, 20 Jan 1986)				
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009504	MN -20	11:31024
3	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009511	MN -20	11:31025
CONF-860171-	(Advanced steady state neutron sources, Washington, DC, USA, 1 Jan 1986)				
1	*See* BNL-37931	E 1.99:	DE86009919	MN -80	11:29784
CONF-860172-	(Japan Ceramic Society meeting, Sendai, Japan, 24 Jan 1986)				
1	*See* LBL-20816	E 1.99:	DE86009358	MN -94c	11:29902
CONF-860204-	(Thermal reactor safety meeting, San Diego, CA, USA, 2-6 Feb 1986)				
40	*See* BNL-NUREG-37869		TI86009430	MN -80	11:29829
41	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009457	MN -78	11:29748
CONF-860270-	(4. winter workshop on nuclear dynamics, Copper Mountain, CO, USA, 24-28 Feb 1986)				
8	*See* LBL-21165	E 1.99:	DE86009356	MN -34C	11:30937
CONF-860272-	(Wire chamber conference, Vienna, Austria, 25-28 Feb 1986)				
5	*See* BNL-37948	E 1.99:	DE86009940	MN -34A	11:30422
7	*See* LBL-20664	E 1.99:	DE86009362	MN -37	11:30425
CONF-860280-	(Defense Nuclear Agency program technical review, Moffett Field, CA, USA, 25-27 Feb 1986)				
1	*See* UCRL-94226	E 1.99:	DE86008021	MN -11	11:30545
CONF-860286-	(6. international conference of the Resource Development Council for Alaska, Anchorage, AK, USA, 12 Feb 1986)				
1	NTIS, PC A02/MF A01; 1		DE86901185	MN -98A	11:29225
CONF-860304-	(Corrosion '86, Houston, TX, USA, 17-21 Mar 1986)				
7	*See* SAND-85-2712C	E 1.99:	DE86009623	MN -66d	11:29623
CONF-860309-	(37. Pittsburgh conference and exposition on analytical chemistry and applied spectroscopy, Atlantic City, NJ, USA, 10-14 Mar 1986)				
1	*See* DOE/PC/80532-3	E 1.99:	DE86009583	MN -4	11:30238
CONF-860316-	(Topical meeting on short wavelength coherent radiation, Monterey, CA, USA, 24-27 Mar 1986)				
4	*See* BNL-37898	E 1.99:	DE86009917	MN -34A	11:30361
5	*See* LA-UR-86-1378	E 1.99:	DE86010194	MN -38	11:30341
6	*See* LA-UR-86-1420	E 1.99:	DE86010201	MN -38	11:30363
CONF-860317-	(Waste management '86, Tucson, AZ, USA, 2-6 Mar 1986)				
38	*See* HEDL-SA-3467-FP	E 1.99:	DE86009412	MN -83	11:30340
44	*See* RHO-RE-SA-116-P	E 1.99:	DE86009591	MN -11	11:30616
45	*See* PNL-SA-13396	E 1.99:	DE86010220	MN -70	11:29411
46	*See* PNL-SA-13733	E 1.99:	DE86010221	MN -70	11:29412
47	*See* PNL-SA-13395	E 1.99:	DE86010222	MN -71	11:29304

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
CONF-860324-	(High temperature plasma diagnostics, Hilton Head Island, SC, USA, 9-13 Mar 1986)			
2-Rev.1	*See* UCRL-93834-Rev.1	E 1.99: DE86009386	MN -20a	11:31082
3-Rev.1	*See* UCRL-93878-Rev.1	E 1.99: DE86009894	MN -20	11:30984
24	*See* GA-A-18415	E 1.99: DE86010217	MN -20	11:30972
25	*See* GA-A-18388	E 1.99: DE86010216	MN -20	11:31069
26	*See* GA-A-18414	E 1.99: DE86010210	MN -20	11:30971
CONF-860340-	(115. American Institute of Mining, Metallurgical and Petroleum Engineers annual meeting, New Orleans, LA, USA, 2-6 Mar 1986)			
4	*See* PNL-SA-13067	E 1.99: DE86010219	MN -25	11:30105
CONF-860363-	(ISSCO week, New Orleans, LA, USA, 10 Mar 1986)			
3	*See* UCRL-94340	E 1.99: DE86009698	MN -32	11:31289
CONF-860384-	(Conference on measurement of electrical quantities in pulse power systems-II, Gaithersburg, MD, USA, 5-7 Mar 1986)			
7	*See* UCRL-93207	E 1.99: DE86009717	MN -38	11:29564
CONF-860390-	(Conference on acid rain: clouds over the Midwest - science and solutions, Chicago, IL, USA, 7-8 Mar 1986)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86008000	MN -11	11:30525
CONF-8603100-	(Scientific Research Society Oak Ridge Chapter meeting, Oak Ridge, TN, USA, 11 Mar 1986)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86008228	MN -13	11:30735
CONF-8603101-	(Freshwater wetlands and wildlife symposium, Charleston, SC, USA, 24-27 Mar 1986)			
1	*See* DP-MS-85-120	E 1.99: DE86008900	MN -11	11:30620
2	*See* DP-MS-85-119	E 1.99: DE86008904	MN -11	11:30595
CONF-8603109-	(4. European symposium on semiconductor detectors, Munich, F.R. Germany, 3-5 Mar 1986)			
1	*See* BNL-37899	E 1.99: DE86009428	MN -37	11:30423
2	*See* LBL-20664	E 1.99: DE86009362	MN -37	11:30425
CONF-8603110-	(Symposium on structure/property relationships, New Orleans, LA, USA, 3 Mar 1986)			
1	*See* LBL-20485	E 1.99: DE86009361	MN -25	11:30100
CONF-8603112-	(Winter school on aperiodic crystals, Les Houches, France, 11-17 Mar 1986)			
1	*See* BNL-37962	E 1.99: DE86009945	MN -34	11:30952
CONF-860412-	(13. European conference on controlled fusion and plasma heating, Schliersee, F.R. Germany, 14-18 Apr 1986)			
2	*See* UCRL-93970	E 1.99: DE86009405	MN -20a	11:30985
5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86010018	MN -20	11:31026
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86010022	MN -20	11:31027
7	*See* GA-A-18380	E 1.99: DE86010223	MN -20	11:30969
8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010016	MN -20	11:31028
CONF-860413-	(2. international symposium on ceramic materials and components for engines, Luebeck-Travemuende, F.R. Germany, 14-17 Apr 1986)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009513	MN -25	11:30143
CONF-860414-	(6. power plant dynamics, control and testing symposium, Knoxville, TN, USA, 14-16 Apr 1986)			
2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007240	MN -80	11:29809
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007156	MN -80	11:29817
CONF-860415-	(International topical meeting on advances in human factors in nuclear power systems, Knoxville, TN, USA, 21-24 Apr 1986)			
4	NTIS, PC A02/MF A01 - GPO	T186006070	MN -80	11:29791
CONF-860418-	(88. annual meeting of the American Ceramic Society, Chicago, IL, USA, 27 Apr-1 May 1986)			
3	*See* SAND-86-1024C	E 1.99: DE86009850	MN -25	11:30388
CONF-860421-	(2. international conference on fusion reactor materials (ICFRM-2), Chicago, IL, USA, 13-17 Apr 1986)			
24	*See* HEDL-SA-3407-FP	E 1.99: DE86009417	MN -20c	11:30097
25	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009502	MN -20c	11:30080
28	NTIS, PC A03; 3	DE86010025	MN -20c	11:30081
CONF-860434-	(IEEE international conference on robotics and automation, San Francisco, CA, USA, 14-17 Apr 1986)			
3	*See* SAND-85-2152C	E 1.99: DE86002118	MN -80	11:29823
4	*See* SAND-85-2103C	E 1.99: DE86000206	MN -80	11:29822
CONF-860438-	(31. national symposium and exhibition of the Society for the Advancement of Material and Process Engineering, Las Vegas, NV, USA, 8-10 Apr 1986)			
3	*See* N-86-17477			11:30144
CONF-860445-	(Materials Research Society spring meeting, Palo Alto, CA, USA, 15-18 Apr 1986)			
7	*See* SAND-85-2446C	E 1.99: DE86009851	MN -25	11:30163
8	*See* LBL-21214	E 1.99: DE86009925	MN -25	11:30161
CONF-860454-	(2. international topical meeting on nuclear power plant thermal hydraulics and operations, Tokyo, Japan, 15-17 Apr 1986)			
2	*See* LA-UR-85-3959	T186003680	MN -78	11:29845
3	*See* LA-UR-85-3958	E 1.99: DE86003681	MN -78	11:29844

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
4	*See* BNL-NUREG-37705		TI86007137	MN -78	11:29828
CONF-860475-	(International conference on acoustics, speech and signal processing, Tokyo, Japan, 7-11 Apr 1986)				
2	*See* BNL-37891	E 1.99:	DE86009914	MN -34	11:30955
CONF-8604117-	(10. U.S. TRIGA user's conference, College Station, TX, USA, 7-9 Apr 1986)				
3	*See* SAND-86-0255C	E 1.99:	DE86009379	MN -80	11:29863
4	*See* SAND-86-0277C		DE86009378	MN -80	11:29864
CONF-8604136-	(Society of Petroleum Engineers regional meeting, Oakland, CA, USA, 2-4 Apr 1986)				
6	*See* LBL-21111	E 1.99:	DE86009907	MN -92a	11:29235
CONF-8604144-	(Spring meeting of the Western States Section of the Combustion Institute, Alberta, Canada, 28-30 Apr 1986)				
3	*See* LBL-21299	E 1.99:	DE86009363	MN -4	11:30324
4	*See* SAND-85-1616C	E 1.99:	TI86009861	MN -78	11:29861
CONF-8604147-	(3. symposium on electromagnetic launch technology, Austin, TX, USA, 20-22 Apr 1986)				
9	*See* SAND-86-0966C		DE86009636	MN -38	11:30352
CONF-8604165-	(International conference on heavy ion physics, Rochester, NY, USA, 21-22 Apr 1986)				
2	*See* UCRL-94467	E 1.99:	DE86009892	MN -13	11:30315
CONF-8604166-	(Edison Electric Institute Health Physics Committee spring meeting, Myrtle Beach, SC, USA, 14-17 Apr 1986)				
1	*See* BNL-NUREG-37940		TI86009941	MN -78	11:29830
CONF-8604170-	(Tactical communication conference, Fort Wayne, IN, USA, 22-24 Apr 1986)				
1	*See* UCRL-94310	E 1.99:	DE86009695	MN -32	11:31288
CONF-860515-	(EPS conference on computational physics - computing in plasma physics, Partenkirchen, F.R. Germany, 13-16 May 1986)				
1	*See* GA-A-18412	E 1.99:	DE86010278	MN -20b	11:30970
CONF-860516-	(Annual meeting of the American Society of Lubrication Engineers, Toronto, Ontario, Canada, 12-15 May 1986)				
2	*See* DOE/NASA/50112-64	E 1.99:	DE86008113	STD -96	11:30091
CONF-860551-	(Technical meeting and workshop on fusion reactor design and technology, Yalta, USSR, 26 May-6 Jun 1986)				
1	*See* LA-UR-86-1386	E 1.99:	DE86010195	MN -20	11:31076
CONF-860586-	(World conference on continuing education, Lake Buena Vista, FL, USA, 7-9 May 1986)				
2	*See* UCRL-94518	E 1.99:	DE86010158	MN -13	11:31273
CONF-860591-	(North Atlantic Treaty Organization advanced study institute on physically-based modeling and simulation of climate and climatic change, Erice, Sicily, Italy, 11-23 May 1986)				
1	*See* UCRL-94338	E 1.99:	DE86008764	MN -11	11:30519
CONF-8605102-	(2. conference on satellite meteorology: remote sensing and applications, Williamsburg, PA, USA, 12-16 May 1986)				
1	*See* UCRL-93549	E 1.99:	DE86009722	MN -34B	11:30810
CONF-860603-	(4. European nuclear conference and 9. FORATOM congress (ENC '86) and international nuclear trade fair, Geneva, Switzerland, 1-6 Jun 1986)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86006213	MN -83	11:29292
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86006071	MN -86	11:29293
3	*See* K/PS-5068-EX	E 1.99:	DE86006815	MN -38	11:30385
4	*See* LA-UR-86-273	E 1.99:	DE86007387	MN -10	11:29294
5	*See* LA-UR-86-641	E 1.99:	DE86007377	MN -20d	11:31074
CONF-860604-	(International symposium on the packaging and transport of radioactive materials (PATRAM '86), Davos, Switzerland, 16-20 Jun 1986)				
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86003077	MN -71	11:29298
3	*See* SAND-86-0053C	E 1.99:	DE86005436	MN -71	11:29306
4	*See* SAND-86-0056C	E 1.99:	DE86005437	MN -71	11:30350
5	*See* SAND-86-0052C	E 1.99:	DE86005629	MN -71	11:30349
6	*See* SAND-86-0051C	E 1.99:	DE86005631	MN -71	11:30348
7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009450	MN -71	11:30333
8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009451	MN -71	11:30334
9	*See* SAND-86-1088C	E 1.99:	DE86010095	MN -70	11:29307
CONF-860605-	(13. international symposium on the effects of radiation on materials, Seattle, WA, USA, 23-25 Jun 1986)				
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86005512	MN -25	11:30082
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007238	MN -25	11:29818
4	*See* LA-UR-86-733	E 1.99:	DE86007372	MN -25	11:30099
5	*See* LA-UR-86-679	E 1.99:	DE86007374	MN -20c	11:31075
6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007521	MN -25	11:30083
7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007518	MN -79	11:29777
8	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007513	MN -25	11:30084
9	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008234	MN -20c	11:30085
10	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008491	MN -25	11:30086

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
11	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86008500	MN -25	11:30087
13	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009155	MN -25	11:30088
CONF-860609-	(27. U.S. symposium on rock mechanics, Tuscaloosa, AL, USA, 23-25 Jun 1986)			
1	*See* UCRL-94075	E 1.99: DE86006916	MN -92	11:29250
2	*See* SAND-85-2238C	E 1.99: DE86007147	MN -70	11:30752
3	*See* SAND-86-0412C	E 1.99: DE86007394	MN -70	11:30755
4	*See* SAND-85-2273C	E 1.99: DE86007388	MN -70	11:30753
5	*See* SAND-85-2237C	E 1.99: DE86007390	MN -70	11:30751
8	*See* SAND-85-2075C	E 1.99: DE86007832	MN -92a	11:29251
9	*See* SAND-85-0123C	E 1.99: DE86007826	MN -70	11:30749
10	*See* UCRL-93429	E 1.99: DE86008029	MN -92a	11:29252
11	*See* UCRL-93422	DE86008767	MN -85	11:30757
12	*See* UCRL-93421	DE86009699	MN -85	11:30756
CONF-860610-	(American Nuclear Society annual meeting, Reno, NV, USA, 15-20 Jun 1986)			
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86003086	MN -86	11:30335
3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86005024	MN -34D	11:30946
5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86005383	MN -20c	11:30089
6	*See* SAND-86-0027C	TI86005441	MN -78	11:29862
7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86005385	MN -10	11:30336
9	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86006091	MN -79	11:29778
10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86006173	MN -79e	11:29779
11	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86006123	MN -70	11:29398
12	*See* BNL-NUREG-37616	TI86006879	MN -78	11:29827
13	*See* BNL-NUREG-37615	TI86006880	MN -78	11:29826
14	*See* BNL-NUREG-37617	TI86006881	MN -78	11:29793
15	*See* BNL-NUREG-37612	TI86006883	MN -78	11:29825
19	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007302	MN -20	11:31029
20	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007303	MN -20	11:31030
21	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007322	MN -20c	11:30090
22	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007332	MN -20	11:31031
23	*See* LBL-20979	E 1.99: DE86007484	MN -21	11:30409
25	*See* SAND-86-0476C	E 1.99: DE86007825	MN -78	11:29813
26	*See* SAND-86-0057C	E 1.99: DE86008780	MN -20a	11:31081
CONF-860612-	(4. AIAA/ASME thermophysics and heat transfer conference, Boston, MA, USA, 2-4 Jun 1986)			
3	*See* DP-MS-85-140	E 1.99: DE86008902	MN -38	11:30378
4	*See* SERI/TP-252-2919	E 1.99: DE86004444	MN -59A	11:29603
CONF-860616-	(International symposium on intense dynamic loading and its effects, Beijing, China, 3-7 Jun 1986)			
1	*See* LA-UR-85-2954	E 1.99: DE85017545	MN -45	11:30511
2	*See* LA-UR-85-3375	E 1.99: DE86000807	MN -45	11:30512
3	*See* LA-UR-85-3420	E 1.99: DE86000802	MN -45	11:30513
4	*See* LA-UR-85-3389	E 1.99: DE86000805	MN -25	11:30098
5	*See* LA-UR-85-3264	E 1.99: DE86000764	MN -34	11:30958
6	*See* LA-UR-85-3554	E 1.99: DE86002383	MN -45	11:30514
9	*See* SAND-86-0088C	E 1.99: DE86005626	MN -38	11:30387
CONF-860622-	(OSA/IEEE conference on lasers and electro-optics (CLEO '86), San Francisco, CA, USA, 9-13 Jun 1986)			
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86005384	MN -34	11:30811
CONF-860629-	(Linear accelerator conference, Stanford, CA, USA, 2-6 Jun 1986)			
1	*See* LA-UR-86-1368	DE86010193	MN -28	11:30413
CONF-860635-	(31. international gas turbine conference and exhibit, Dusseldorf, F.R. Germany, 8-12 Jun 1986)			
1	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE86003047	MN -93	11:29669
3	*See* UCRL-94019	E 1.99: DE86007178	MN -93	11:30407
CONF-860638-	(American control conference, Seattle, WA, USA, 18-20 Jun 1986)			
2	*See* BNL-37844	E 1.99: DE86009429	MN -28	11:30392
3	*See* BNL-37846	E 1.99: DE86009442	MN -32	11:30960
4	*See* UCRL-94286	DE86009720	MN -20d	11:31084
CONF-860639-	(Quantitative NDE, Williamsburg, VA, USA, 24 Jun 1986)			
1	*See* EGG-M-27784	E 1.99: DE86003227	MN -38	11:30384
CONF-860651-	(International conference on vibration problems in engineering, Xi'an, China, 17-20 Jun 1986)			
1	*See* UCRL-93600	E 1.99: DE86003470	MN -38	11:30353
CONF-860652-	(7. topical meeting on the technology of fusion energy, Reno, NV, USA, 15-19 Jun 1986)			
1	*See* SAND-86-0017C	E 1.99: DE86004988	MN -21	11:31080
2	*See* SAND-86-0283	E 1.99: DE86006472	MN -20	11:30982
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009484	MN -20f	11:31032
4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009482	MN -20f	11:31033
CONF-860654-	(27. annual meeting of the Institute of Nuclear Materials Management, New Orleans, LA, USA, 22-25 Jun 1986)			
1	*See* BNL-37685	E 1.99: DE86007133	MN -16	11:29452
CONF-860655-	(American Solar Energy Society annual meeting and 11. national passive solar conference, Boulder, CO, USA, 8-14 Jun 1986)			
2	*See* SERI/TP-250-2933	E 1.99: DE86004447	MN -59B	11:29602

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
4	*See* SAND-86-0303C	E 1.99:	DE86009628	MN -62c	11:29608
CONF-860675-	(19. national symposium on fracture mechanics (ASTM), San Antonio, TX, USA, 30 Jun-2 Jul 1986)				
1	NTIS, PC A03/MF A01 - GPO		TI86004821	MN -78	11:29796
CONF-860676-	(3. international stirling engine conference, Rome, Italy, 1 Jun 1986)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86005407	MN -96	11:30048
CONF-860677-	(10. international conference on precious metals, Lake Tahoe, NV, USA, 8-13 Jun 1986)				
1	*See* SAND-85-2550C	E 1.99:	DE86005435	MN -38	11:30330
CONF-860680-	(CPEM conference, Gaithersburg, MD, USA, 23-27 Jun 1986)				
1	*See* SLAC-PUB-3867	E 1.99:	DE86006954	MN -37	11:30499
CONF-860681-	(6. international conference on finite elements in water, Lisbon, Portugal, 1 Jun 1986)				
2	*See* DP-MS-85-138	E 1.99:	DE86008045	MN -70	11:29436
CONF-860682-	(SEM spring conference on experimental mechanics, New Orleans, LA, USA, 8-13 Jun 1986)				
2	*See* SAND-85-1804C		DE86009286	MN -38	11:30345
3	*See* SAND-86-0079C	E 1.99:	DE86009090	MN -38	11:30386
CONF-860684-	(13. Inter-RAM: international reliability, availability and maintainability conference for the electric power industry, Syracuse, NY, USA, 2-5 Jun 1986)				
1	*See* EGG-M-18085	E 1.99:	DE86009079	MN -78	11:29834
CONF-860692-	(Boundary element technology conference, Cambridge, MA, USA, 17-19 Jun 1986)				
1	*See* K/CSD/INF-86/5	E 1.99:	DE86007760	MN -38	11:30328
CONF-860693-	(International symposium on electrical insulation, Washington, DC, USA, 8-11 Jun 1986)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008505	MN -97	11:30393
CONF-860695-	(HazMat '86: hazardous materials management conference and exhibition, Atlantic City, NJ, USA, 2-4 Jun 1986)				
1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010046	MN -70	11:29445
CONF-8606105-	(27. annual logging symposium of the Society of Professional Well Log Analysts, Houston, TX, USA, 9-13 Jun 1986)				
2	*See* UCRL-94208	E 1.99:	DE86009713	MN -38	11:30354
CONF-8606108-	(AGARD symposium, Hague, Netherlands, 2-6 Jun 1986)				
1	*See* LA-UR-86-1011	E 1.99:	DE86008752	MN -34B	11:30809
CONF-8606111-	(6. international symposium on radiopharmaceutical chemistry, Boston, MA, USA, 29 Jun-3 Jul 1986)				
1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009461	MN -48	11:30661
2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009462	MN -48	11:30651
3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009460	MN -48	11:30652
CONF-8606112-	(IASTED modelling and simulation conference, Vancouver, Canada, 4-6 Jun 1986)				
1	*See* SAND-86-0916C	E 1.99:	DE86009639	MN -38	11:30351
CSIR-SR-CHEM-267	NTIS (US Sales Only), PC A09/MF A01		DE86780436	MN -4	11:30193
CSNSM-T-84-01	NTIS (US Sales Only), PC A06/MF A01		DE86751615	MN -34C	11:30909
DAS-170	*See* CEA-CONF-8052		DE86751367	MN -78	11:29757
DERS-SRSC-181	*See* CEA-CONF-8153		DE86751362	MN -80	11:29816
DOE/BC/10830-3	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE86000279	STD -92a	11:29233
DOE/BP-582	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008826	MN -11	11:29905
DOE/BP/11982-1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008821	MN -11	11:30685
DOE/BP/18966-1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008310	MN -11	11:30590
DOE/BP/20733-1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86008824	MN -11	11:29493
DOE/BP/24574-2	NTIS, PC A12/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009635	MN -62	11:29497
DOE/BP/33825-1	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008828	MN -11	11:30621
DOE/BP/39644-1	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008914	MN -11	11:29494
DOE/CE/15192-T1	NTIS, PC A04; 3		DE86009973	MN -38	11:30394
T2	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010211	MN -38	11:30395
DOE/CE/40543-1	NTIS, PC A19/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009111	MN -93	11:29215
6	NTIS, PC A17/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009116	MN -93	11:29216
DOE/CE/50036-H1	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009881	STD -96	11:30069
DOE/CH/10088-2018	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009536	STD -90c	11:29154

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
DOE/CS/30475-T3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010150	MN -58	11:29496
DOE/CS/60210-T1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009277	MN -98	11:29920
DOE/DP/00789-T246	NTIS, PC A02/MF A01 - GPO		TI86009627	MN -78	11:29797
DOE/EI/06320-T2	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008287	MN -98G	11:29946
T3-Vol.1	NTIS, PC A10/MF A01; 1 - GPO		DE86008288	MN -98G	11:29947
T3-Vol.2-Pt.1	NTIS, PC A07/MF A01; 1 - GPO (GPO Dep.)	E 1.99:	DE86008286	MN -98G	11:29979
T3-Vol.2-Pt.2	NTIS, PC A99/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008285	MN -98G	11:29980
T3-Vol.3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008284	MN -98G	11:29948
DOE/EI/10464-T2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010345	MN -92	11:29244
DOE/EIA-0185(85)	NTIS, PC A08/MF A01; 1 - GPO (GPO Dep.)	E 1.99:	DE86009120	MN -98	11:29245
0333(86)	NTIS, PC A03/MF A01 - GPO (GPO Dep.)	E 1.99:	DE86009888	MN -98A	11:29226
0380(86/ 02)	NTIS, PC A08/MF A01; 1 - GPO (GPO Dep.)	E 1.99:	DE86010273	MN -98B	11:29246
0455(84)	NTIS, PC A12/MF A01; 1 - GPO (GPO Dep.)	E 1.99:	DE86009121	MN -98	11:29944
0474(86)	NTIS, PC A04/MF A01 - GPO (GPO Dep.)	E 1.99:	DE86010010	MN -98E	11:29945
DOE/ER-0113/ 5	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010065	STD -20c	11:31067
0191/ 3	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009937	MN -2	11:30762
0268	NTIS, PC A04/MF A01 - GPO		TI86009876	MN -13	11:31271
DOE/ER/02542-4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010340	MN -4	11:30194
DOE/ER/02944-9	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009928	MN -4	11:30322
DOE/ER/03244-121	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009675	MN -34C	11:30896
DOE/ER/04392-8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010368	MN -92a	11:29231
DOE/ER/04928-7	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009806	MN -34D	11:30851
8	NTIS, PC A02; 3		DE86009807	MN -34D	11:30852
10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009805	MN -34D	11:30853
11	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009812	MN -34D	11:30854
12	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009801	MN -34D	11:30855
13	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009800	MN -34D	11:30856
DOE/ER/06030-T4	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010338	MN -4	11:30234
DOE/ER/10434-6	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE86009516	MN -34C	11:30930
DOE/ER/10689-6	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009762	MN -4	11:30235
7	*See* DOE/ER/10689-6	E 1.99:	DE86009762	MN -4	11:30235
DOE/ER/10690-6	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009517	MN -34D	11:30823
DOE/ER/10803-5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010287	MN -48	11:29501
DOE/ER/10980-4	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010370	MN -4	11:30195
DOE/ER/12015-T1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009231	MN -48	11:29502
DOE/ER/13022-3	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009965	MN -4	11:30236
DOE/ER/13112-3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009317	MN -11	11:30758
DOE/ER/13234-2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009632	MN -48	11:29503
DOE/ER/13259-T2	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009034	MN -11	11:30759
DOE/ER/13260-T2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010236	MN -4	11:30237
DOE/ER/13394-1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010285	MN -34A	11:30812
DOE/ER/13456-1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010284	MN -34	11:30813
DOE/ER/40020-T2	NTIS, PC A01/MF A01 (GPO Dep.)	E 1.99:	DE86009771	MN -34C	11:30890
DOE/ER/40085-10	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009946	MN -34D	11:30824
DOE/ER/40157-3	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009672	MN -34C	11:30947
DOE/ER/45113-2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010283	MN -38	11:30337
DOE/ER/53134-T1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009884	MN -20	11:30962
T2	NTIS, PC A02; 3		DE86009885	MN -20	11:30963
DOE/ER/53140-24	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010234	MN -20g	11:30964
DOE/ER/53206-T1	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009804	MN -20a	11:30965

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
DOE/ER/60134-2	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE86010235	MN -48	II:30580
DOE/ER/60158-2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009802	MN -48	II:30715
DOE/ER/80108-T1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86008099	MN -66	II:29637
DOE/ET/34072-4-Draft	NTIS (US Sales Only), PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010106	MN -78	II:29749
DOE/EV/01525-T6	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008919	MN -11	II:30591
DOE/EV/04268-T5	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009920	MN -48	II:30662
DOE/EV/10359-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010376	MN -48	II:30663
DOE/FE/55014-T20	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010245	MN -90c	II:29198
T21	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010246	MN -90c	II:29155
DOE/ID-12106	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008893	MN -11	II:30581
DOE/JPL-1012-114	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010243	MN -63b	II:29559
DOE/JPL/1012-112	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010242	MN -63e	II:29504
DOE/JPL/956679-84/ 6	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009833	MN -63b	II:29505
DOE/MC/19210-2043	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010137	MN -90c	II:29156
DOE/MC/21136-6	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE86000283	STD -92a	II:29234
DOE/METC-86/ 2025	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99:	DE86003718	MN -90c	II:29157
86/ 4060	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86006603	MN -90d	II:29158
DOE/MI/01005-T1-Exec.Summ.	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE86009535	MN -13	II:29941
DOE/NASA-0351-1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009863	STD -96	II:30049
DOE/NASA/50112-64	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008113	STD -96	II:30091
DOE/NE/44352-1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009868	MN -70	II:29400
DOE/NV/10081-3-Pts.1-2	NTIS, PC A21/MF A01; 1 (GPO Dep.)	E 1.99:	DE85016048	MN -66b	II:29638
DOE/NV/10282-5013	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009847	MN -34	II:30808
DOE/NV/10327-24	NTIS, PC A99; 3		DE86009081	MN -41	II:30736
DOE/OR/21400-T239	NTIS MF A01; 2 (GPO Dep.)	E 1.99:	DE86007325	MN -20a	II:31068
T258	NTIS, PC A02/MF A01 - GPO		TI86008890	MN -80	II:29833
DOE/PC/50803-T1	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010103	MN -90a	II:29174
DOE/PC/60015-36	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009308	MN -90d	II:29175
DOE/PC/60039-8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86007958	MN -90a	II:29176
DOE/PC/60787-10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009738	MN -90d	II:29159
DOE/PC/60791-9	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010155	MN -90a	II:29177
DOE/PC/60800-10	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009824	MN -90c	II:29160
DOE/PC/60802-10	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99:	DE86005495	STD -90i	II:29186
DOE/PC/70006-9	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009823	MN -90d	II:29178
DOE/PC/70061-7	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009841	MN -90b	II:29179
DOE/PC/70771-T3	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009845	MN -90e	II:29187
DOE/PC/70781-T5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009849	MN -90b	II:29180
DOE/PC/70782-6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009770	MN -90a	II:29181
DOE/PC/70792-T6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010012	MN -90a	II:29182
DOE/PC/70794-6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009598	MN -90e	II:29217
DOE/PC/70796-8	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009837	MN -90a	II:29204
DOE/PC/70799-T5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009566	MN -90d	II:29183
DOE/PC/70801-T6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009772	MN -90d	II:29161

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
DOE/PC/70802-T2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86009518	MN -90d	11:29162
DOE/PC/70803-T6	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009465	MN -90a	11:29205
DOE/PC/70811-5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009296	MN -90d	11:29163
DOE/PC/80517-T1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009580	MN -90b	11:29206
DOE/PC/80530-T2	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86009593	MN -90a	11:29207
DOE/PC/80532-3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009583	MN -4	11:30238
DOE/PC/80911-T2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010093	MN -90a	11:29184
DOE/PC/81210-T10	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009307	MN -90b	11:29208
DOE/RA/50179-T1	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE86009315	MN -90j	11:29228
DOE/RL/02225-19	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86008682	MN -11	11:30594
DOE/SF/11918-T2	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86010134	MN -59A	11:29565
DOE/SF/12197-T6	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE86009828	MN -38	11:30377
DOE/SF/15799-T5	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009327	MN -66b	11:29642
DP-1714	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009572	STD -11	11:30496
DP-1717	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86009571	STD -11	11:30582
Dr'-MS-85-119	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86008904	MN -11	11:30595
85-120	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86008900	MN -11	11:30620
85-138	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86008045	MN -70	11:29436
85-140	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86008902	MN -38	11:30378
86-37	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86010315	MN -70	11:29299
DPh-N-S-2297	*See* CEA-CONF-8043	DE86751605	MN -34C	11:30892
DRD-SE-2	*See* DOE/JPL/956679-84/6	E 1.99: DE86009833	MN -63b	11:29505
DRL-207	*See* DOE/JPL/956679-84/6	E 1.99: DE86009833	MN -63b	11:29505
DSIR-GD-202	Department of Scientific and Industrial Research, Wellington, New Zealand			11:29202
E-2668	*See* N-86-16258			11:29785
2706	*See* N-86-17839			11:29516
2820	*See* N-86-17472			11:30123
2860	*See* N-86-17477			11:30144
2864	*See* N-86-16599			11:30122
2869	*See* N-86-16334			11:29786
2876	*See* N-86-16221			11:30035
EDF-84H531172	NTIS (US Sales Only), PC A06/MF A01	DE86751339	MN -79	11:29780
EDF-DER-RA-1984	NTIS (US Sales Only), PC A15/MF A01	DE86751323	MN -80	11:29746
EEB-BED-85-11	*See* LBL-18306	E 1.99: DE86009904	MN -95d	11:30001
EEB-EPB-86-07	*See* LBL-18732	E 1.99: DE86009896	MN -95d	11:30002
EEB-W-86-04	*See* LBL-20348	E 1.99: DE86009947	MN -95d	11:30003
EEG-32	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99: DE86007804	MN -70	11:30740
EGG-10282-1084	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86006849	STD -41	11:30583
EGG-EP-7076	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE86009105	MN -66	11:29629
EGG-M-05585	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86007635	MN -38	11:30383
18085	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009079	MN -78	11:29834
27784	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86003227	MN -38	11:30384
ENEA-RT-PAS-84-16	NTIS (US Sales Only), PC A04/MF A01	DE86701588	MN -48	11:30691
ENEA-RT/PROT-83-23	NTIS (US Sales Only), PC A02/MF A01; 1	DE86901005	MN -11	11:30610
ENEA-RT/STUDI-85-1	NTIS (US Sales Only), PC A02/MF A01; 1	DE86900964	MN -41	11:30527
EPA-440/ 5-85-001	US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC, USA			11:29188

Report Number	*Availability Source*	*File Number*	*Distribution Category*	*Abstract Number*
EPRI-EA-				
4447-Vol.1	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI86920253	ND -41	11:30716
4447-Vol.2	Research Reports Center, Box 50490, Palo Alto, CA 94303	TI86920254	ND -41	11:30717
EPRI-NP-				
4478	Research Reports Center, P.O. Box 50490, Palo Alto, CA 94303	TI86920242	ND -78	11:29765
ESA-CR(P)-				
078	NTIS, PC A11/MF A01			11:30032
ESA-SP-				
30	NTIS, PC A15/MF A01			11:29506
ETSU-R-				
25	H.M. Stationery Office, London, price Pound 15		ND -59A	11:29566
26	H.M. Stationery Office, London, price Pound 8.00		ND -64	11:29643
30	H.M. Stationery Office, London, price Pound 7.00		ND -13	11:29916
36	NTIS (US Sales Only), PC A05/MF A01; 1	DE86751892	MN -60	11:29651
ETY-				
1/ 1982	NTIS (US Sales Only), PC A05/MF A01; 1	DE86751658	MN -95e	11:30024
2/ 1983	NTIS (US Sales Only), PC A07/MF A01; 1	DE86751659	MN -95f	11:30025
3/ 1983	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751660	MN -95d	11:29996
4/ 83	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751661	MN -13	11:29917
5/ 1983	NTIS (US Sales Only), PC A05/MF A01; 1	DE86751662	MN -95f	11:30026
6/ 1983	NTIS (US Sales Only), PC A05/MF A01; 1	DE86751663	MN -97d	11:29675
7/ 1983	NTIS (US Sales Only), PC A03/MF A01; 1	DE86751665	MN -95e	11:30027
8/ 1983	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751664	MN -95f	11:29997
10/ 1984	NTIS (US Sales Only), PC A05/MF A01; 1	DE86751666	MN -95d	11:29998
11/ 1984	NTIS (US Sales Only), PC A04/MF A01	DE86751667	MN -95e	11:30028
13/ 85	NTIS (US Sales Only), PC A06/MF A01; 1	DE86751668	MN -90b	11:29209
14/ 1985	NTIS (US Sales Only), PC A06/MF A01; 1	DE86751669	MN -95f	11:30029
15/ 85	NTIS (US Sales Only), PC A06/MF A01; 1	DE86751670	MN -97d	11:29676
EUR-				
8906	NTIS (US Sales Only), PC A08/MF A01	DE86751872	MN -61	11:29484
9379	NTIS (US Sales Only), PC A05/MF A01	DE86751639	MN -71	11:30338
9404	NTIS (US Sales Only), PC A05/MF A01	DE86751870	MN -90e	11:29218
9536	NTIS (US Sales Only), PC A07/MF A01	DE86751638	MN -11	11:30536
9541-Pt.1	NTIS (US Sales Only), PC A06/MF A01	DE86751608	MN -45	11:30508
9593	NTIS (US Sales Only), PC A06/MF A01	DE86751607	MN -45	11:30323
9651	NTIS (US Sales Only), PC A03/MF A01	DE86751325	MN -80	11:29819
9659-FR	European Community Information Service, 2100 M St., NW, Suite 707, Washington, DC 20057			11:29199
9673-Vol.2	NTIS (US Sales Only), PC A99/MF A01	DE86780449	MN -11	11:30558
9676-Vol.1	NTIS (US Sales Only), PC A07/MF A01	DE86751640	MN -80	11:30509
9676-Vol.2	NTIS (US Sales Only), PC A08/MF A01	DE86751647	MN -80	11:30510
9679	NTIS (US Sales Only), PC A05/MF A01	DE86751326	MN -80	11:29798
9836	NTIS (US Sales Only), PC A06/MF A01	DE86751643	MN -70	11:30092
9862	NTIS (US Sales Only), PC A07/MF A01	DE86751641	MN -80	11:29835
9865	NTIS (US Sales Only), PC A03/MF A01	DE86751642	MN -25	11:30093
9874	NTIS (US Sales Only), PC A04/MF A01	DE86751613	MN -79	11:31278
9875	NTIS (US Sales Only), PC A08/MF A01	DE86751648	MN -25	11:30094
9877	NTIS (US Sales Only), PC A03/MF A01	DE86751609	MN -78	11:29766
9925	NTIS (US Sales Only), PC A06/MF A01	DE86780450	MN -80	11:30559
10063-FR	European Community Information Service, 2100 M St., NW, Suite 707, Washington, DC 20057			11:29164
10064-FR	European Community Information Service, 2100 M St., NW, Suite 707, Washington, DC 20057			11:29165
10074	NTIS (US Sales Only), PC A99/MF A01	DE86780451	MN -78	11:29836
10075	NTIS (US Sales Only), PC A05/MF A01	DE86780452	MN -78	11:30379
10076	NTIS (US Sales Only), PC A09/MF A01	DE86780453	MN -78	11:29837
10077	NTIS (US Sales Only), PC A04/MF A01	DE86751645	MN -80	11:29838
10078	NTIS (US Sales Only), PC A23/MF A01	DE86780454	MN -78	11:29839
10079-Vol.1	NTIS (US Sales Only), PC A99/MF A01	DE86780455	MN -78	11:29840
10079-Vol.2	NTIS (US Sales Only), PC A09/MF A01	DE86780456	MN -78	11:29841
10115	NTIS (US Sales Only), PC A09/MF A01	DE86751612	MN -80	11:31279
10165	NTIS (US Sales Only), PC A14/MF A01	DE86751611	MN -78	11:29842
10194	NTIS (US Sales Only), PC A07/MF A01	DE86751610	MN -80	11:29820
10213	NTIS (US Sales Only), PC A02/MF A01	DE86751646	MN -4	11:30178
EUR-CEA-FC-				
1264	NTIS (US Sales Only), PC A02/MF A01	DE86751586	MN -20f	11:30966
1265	NTIS (US Sales Only), PC A08/MF A01	DE86751594	MN -20a	11:30967
FNAL/C-				
86/ 30	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86009872	MN -28	11:30412
FNAL/Pub-				
86/ 36-A	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009992	MN -34B	11:30763
86/ 38-A	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009989	MN -34B	11:30880
86/ 47-A	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009990	MN -34B	11:30764
86/ 48-A	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009993	MN -34B	11:30765
86/ 49-A	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009988	MN -34B	11:30766
86/ 57-A	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009987	MN -34B	11:30767
FOA-C-				
20589-E3	*See* STEV-VIND-85-41	DE86751692	MN -60	11:29668
FRADOC-				
1-1	NTIS (US Sales Only), PC A02/MF A01	DE86751360	MN -78	11:29767
1-2	NTIS (US Sales Only), PC A02/MF A01	DE86751359	MN -78	11:29768

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
1-3	NTIS (US Sales Only), PC A02/MF A01	DE86751358	MN -78	11:29769
2-1	NTIS (US Sales Only), PC A02/MF A01	DE86751317	MN -80	11:29799
2-6	NTIS (US Sales Only), PC A02/MF A01	DE86751318	MN -78	11:29770
3-1	NTIS (US Sales Only), PC A02/MF A01	DE86751316	MN -78	11:29771
3-2	NTIS (US Sales Only), PC A02/MF A01	DE86751315	MN -78	11:29772
FRNC-TH-				
2074	NTIS (US Sales Only), PC A06/MF A01	DE86751371	MN -48	11:30664
2128	NTIS (US Sales Only), PC A08/MF A01	DE86751319	MN -38	11:30339
2131	NTIS (US Sales Only), PC A12/MF A01	DE86751322	MN -25	11:30155
2164	NTIS (US Sales Only), PC A06/MF A01	DE86751593	MN -34C	11:30968
2216	NTIS (US Sales Only), PC A10/MF A01	DE86751372	MN -11	11:30560
2223	NTIS (US Sales Only), PC A10/MF A01	DE86751368	MN -51	11:29291
GA-A-				
18285	NTIS, PC A14/MF A01; 1 (GPO Dep.)	E 1.99: DE86009082	MN -61D	11:29513
18380	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010223	MN -20	11:30969
18388	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010216	MN -20	11:31069
18412	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010278	MN -20b	11:30970
18414	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86010210	MN -20	11:30971
18415	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010217	MN -20	11:30972
GANIL-P-				
85-06	NTIS (US Sales Only), PC A02/MF A01	DE86751321	MN -34C	11:30931
GAO/RCED-				
86-41	US General Accounting Office, Box 6015, Gaithersburg, MD 20877	TI86901210	MN -80	11:29787
86-50	General Accounting Office, Box 6015, Gaithersburg, MD 20877	TI86901211	MN -70	11:29936
GB-				
4	NTIS (US Sales Only), PC A02/MF A01; 1	DE86751893	MN -95f	11:29677
9	NTIS (US Sales Only), PC A02/MF A01; 1	DE86009887	MN -61	11:29485
11	NTIS (US Sales Only), PC A03/MF A01; 1	DE86751889	MN -92	11:29230
GEND-				
055	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE86009454	STD -78	11:29843
GESC-				
85-9.C	NTIS (US Sales Only), PC A03/MF A01; 1	DE86751869	MN -66a	11:29616
GKSS-				
85/ E/ 29	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751721	MN -25	11:30095
GRI-				
86/ 0087	*See* ORNL/TM-10018	E 1.99: DE86010269	MN -61G	11:29546
GRS-				
59	NTIS (US Sales Only), PC A10/MF A01; 1	DE86751724	MN -41	11:30390
GS-CIRC-				
79	NTIS, PC A02/MF A01			11:29401
001	NTIS, PC A04/MF A01			11:30603
GSF-				
35/ 85	NTIS (US Sales Only), PC A06/MF A01; 1	DE86751725	MN -48	11:30718
HEDL-				
7467	NTIS, PC A10/MF A01 - GPO	TI86009423	MN -78	11:29750
HEDL-SA-				
3291	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86009415	MN -25	11:30096
3407-FP	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009417	MN -20c	11:30097
3467-FP	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86009412	MN -83	11:30340
IAEA-SM-				
273/ 33	*See* ENEA-RT/STUDI-85-1	DE86900964	MN -41	11:30527
274-C5	*See* FRADOC-3-1	DE86751316	MN -78	11:29771
IC-				
84/ 232	NTIS (US Sales Only), PC A02/MF A01	DE86701711	MN -34D	11:30957
84/ 247	NTIS (US Sales Only), PC A04/MF A01	DE86701787	MN -34D	11:30857
85/ 34	NTIS (US Sales Only), PC A02/MF A01	DE86701788	MN -34D	11:30858
85/ 35	NTIS (US Sales Only), PC A02/MF A01	DE86701775	MN -34B	11:30768
85/ 36	NTIS (US Sales Only), PC A02/MF A01	DE86701800	MN -34C	11:30918
85/ 38	NTIS (US Sales Only), PC A02/MF A01	DE86701779	MN -34A	11:30820
85/ 42	NTIS (US Sales Only), PC A02/MF A01	DE86701783	MN -34D	11:30859
85/ 45	NTIS (US Sales Only), PC A02/MF A01	DE86701801	MN -34C	11:30932
85/ 47	NTIS (US Sales Only), PC A02/MF A01	DE86701776	MN -34B	11:30769
85/ 63	NTIS (US Sales Only), PC A02/MF A01	DE86701782	MN -34D	11:30860
85/ 66	NTIS (US Sales Only), PC A02/MF A01	DE86701789	MN -34D	11:30861
85/ 74	NTIS (US Sales Only), PC A02/MF A01	DE86701803	MN -34C	11:30908
85/ 75	NTIS (US Sales Only), PC A02/MF A01	DE86701784	MN -34D	11:30862
ICTIS/M-				
0179	International Energy Agency Coal Research, London, England			11:29229
0182	International Energy Agency Coal Research, London, England			11:29219
0186	IEA Coal Research, London, UK			11:29220
0187	IEA Coal Research, London, UK			11:29196
0188	IEA Coal Research, London, UK			11:29678
0189	IEA Coal Research, London, UK			11:29197
0190	IEA Coal Research, London, UK			11:29221
0191	IEA Coal Research, London, UK			11:29222
0192	IEA Coal Research, London, UK			11:29223
0193	IEA Coal Research, London, UK			11:29166
0194	IEA Coal Research, London, UK			11:29679
0195	IEA Coal Research, London, UK			11:29680

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
ICTP-IC-				
85/ 253	NTIS (US Sales Only), PC A02; 3	DE86901309	MN -34D	11:30881
85/ 284	NTIS (US Sales Only), PC A02/MF A01; 1	DE86901302	MN -34D	11:30882
IEA/ICEAS-				
C3	NTIS (US Sales Only), PC A04/MF A01	TI86901359	MN -90b	11:29210
IEA/ICTIS/TR-				
31	NTIS (US Sales Only), PC A04/MF A01	TI86901297	MN -92b	11:29211
IFT-P-				
14/ 85	NTIS (US Sales Only), PC A02/MF A01	DE86701777	MN -34B	11:30770
IFUSP-P-				
544	NTIS (US Sales Only), PC A02/MF A01	DE86701790	MN -34D	11:30863
IKE-				
2-70	NTIS (US Sales Only), PC A05/MF A01; 1	DE86751722	MN -92a	11:29243
INDC(EUR)-				
0191G	*See* NEANDC(E)-262-U-Vol.3-EURATOM	DE86901253	MN -34C	11:30891
INDC(JPN)-				
89/ L	*See* JAERI-M-84-117	DE84901729	MN -34D	11:30913
90/ L	*See* JAERI-M-84-163	DE84901850	MN -34C	11:30899
91/ L	*See* JAERI-M-84-165	DE84901864	MN -34C	11:30900
94/ GL	*See* JAERI-M-84-198	DE85901060	MN -34C	11:30901
95/ L	*See* JAERI-M-84-204	DE85900705	MN -34C	11:30902
96/ L	*See* JAERI-M-84-226	DE85901057	MN -34C	11:30903
INIS-BR-				
453	NTIS (US Sales Only), PC A02/MF A01	DE86701819	MN -34C	11:30928
456	NTIS (US Sales Only), PC A09/MF A01	DE86701820	MN -4	11:30179
INIS-mf-				
9876	NTIS (US Sales Only), PC A08/MF A01	DE86751632	MN -48	11:30692
9877	NTIS (US Sales Only), PC A03/MF A01	DE86751633	MN -48	11:30693
10040	NTIS (US Sales Only), PC A14/MF A01	DE86701793	MN -34D	11:30825
10098	NTIS (US Sales Only), PC A03/MF A01	DE86780445	MN -25	11:30159
INPE-				
561-NTE/ 236	NTIS, PC A02/MF A01			11:30497
INS-				
517	NTIS (US Sales Only), PC A03/MF A01	DE86701804	MN -34C	11:30933
518	NTIS (US Sales Only), PC A02/MF A01	DE86701799	MN -34C	11:30934
519	NTIS (US Sales Only), PC A02/MF A01	DE86701802	MN -34C	11:30935
520	NTIS (US Sales Only), PC A03/MF A01	DE86701805	MN -34C	11:30893
521	NTIS (US Sales Only), PC A02/MF A01	DE86701809	MN -34C	11:30906
522	NTIS (US Sales Only), PC A02/MF A01	DE86701808	MN -34C	11:30894
525	NTIS (US Sales Only), PC A03/MF A01	DE86701791	MN -34D	11:30864
526	NTIS (US Sales Only), PC A02/MF A01	DE86701807	MN -34C	11:30895
IPNO-DRE-				
85-11	NTIS (US Sales Only), PC A04/MF A01	DE86751617	MN -34C	11:30911
IPNO-GEPL-				
83-13	NTIS (US Sales Only), PC A03/MF A01	DE86751320	MN -28	11:30408
IPNO-T-				
83-04	NTIS (US Sales Only), PC A07/MF A01	DE86751619	MN -34C	11:30897
IPNO-TH-				
85-07	NTIS (US Sales Only), PC A02/MF A01	DE86751598	MN -34D	11:30865
ISN-				
83-36	NTIS (US Sales Only), PC A06/MF A01	DE86751614	MN -34C	11:30912
85-05	NTIS (US Sales Only), PC A07/MF A01	DE86751616	MN -34C	11:30898
85-30	NTIS (US Sales Only), PC A02/MF A01	DE86751618	MN -34C	11:30936
ISPO-				
257	*See* K/OA-6004	E 1.99: DE86009735	MN -15	11:29453
JAERI-M-				
84-117	NTIS (US Sales Only), PC A03/MF A01; 1	DE84901729	MN -34D	11:30913
84-163	NTIS (US Sales Only), PC A03/MF A01	DE84901850	MN -34C	11:30899
84-165	NTIS (US Sales Only), PC A03/MF A01	DE84901864	MN -34C	11:30900
84-198	NTIS (US Sales Only), PC A04/MF A01; 1	DE85901060	MN -34C	11:30901
84-204	NTIS (US Sales Only), PC A03/MF A01; 1	DE85900705	MN -34C	11:30902
84-226	NTIS (US Sales Only), PC A05/MF A01; 1	DE85901057	MN -34C	11:30903
JPL-PUB-				
85-75	*See* DOE/JPL/1012-112	E 1.99: DE86010242	MN -63e	11:29504
85-92	*See* DOE/JPL-1012-114	E 1.99: DE86010243	MN -63b	11:29559
JUEL-				
1569	NTIS (US Sales Only), PC A03/MF A01; 1	DE86901195	MN -77	11:29775
2010	NTIS (US Sales Only), PC A09/MF A01	DE86751631	MN -70	11:29402
2013	NTIS (US Sales Only), PC A03/MF A01	DE86751634	MN -38	11:30380
2016	NTIS (US Sales Only), PC A03/MF A01	DE86751635	MN -20f	11:30973
Juel-Spez-				
304	NTIS (US Sales Only), PC A09/MF A01; 1	DE86751709	MN -60	11:29653
K/CSD/INF-				
86/ 5	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86007760	MN -38	11:30328
K/OA-				
6004	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE86009735	MN -15	11:29453
K/PS-				
5068-EX	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99: DE86006815	MN -38	11:30385
KEK-				
83-12	NTIS (US Sales Only), PC A05/MF A01	DE86780434	MN -34D	11:30822
83-31	NTIS (US Sales Only), PC A03/MF A01	DE86780435	MN -34D	11:30831
KFK-				
3826-B	NTIS (US Sales Only), PC A03/MF A01	DE86751408	MN -48	11:30694
3996	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751726	MN -48	11:30719

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
KTM/E-D-					
89	NTIS (US Sales Only), PC A03/MF A01		DE86751649	MN -11	11:29681
90	NTIS (US Sales Only), PC A04/MF A01; 1		DE86751650	MN -95d	11:29999
L-					
15943	*See* N-86-16748				11:30538
LA-					
10449-MS	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99:	DE86009797	STD -70B	11:29403
10574-MS	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009793	STD -70B	11:29404
10627-MS	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009798	STD -34B	11:30975
10645-PR	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009792	STD -80	11:29795
10652-MS	*See* NUREG/CR-3965		TI86009816	MN -77	11:30162
10659-HDR-Vol.1	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009794	STD -66b	11:29622
LA-tr-					
85-58	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009969	MN -4	11:30233
86-14	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009143	MN -41	11:30730
LA-UR-					
83-2954	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE85017545	MN -45	11:30511
85-3264	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86000764	MN -34	11:30958
85-3347	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86000810	MN -34	11:30948
85-3375	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86000807	MN -45	11:30512
85-3389	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86000805	MN -25	11:30098
85-3420	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86000802	MN -45	11:30513
85-3554	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86002383	MN -45	11:30514
85-3938	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86003681	MN -78	11:29844
85-3959	NTIS, PC A02/MF A01 - GPO		TI86003680	MN -78	11:29845
86-273	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86007387	MN -10	11:29294
86-641	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007377	MN -20d	11:31074
86-679	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007374	MN -20c	11:31075
86-733	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86007372	MN -25	11:30099
86-996	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008748	MN -38	11:30362
86-1011	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008752	MN -34B	11:30809
86-1202	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010173	MN -25	11:30160
86-1233	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010176	MN -34D	11:30872
86-1368	NTIS, PC A02; 3		DE86010193	MN -28	11:30413
86-1378	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010194	MN -38	11:30341
86-1386	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010195	MN -20	11:31076
86-1420	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010201	MN -38	11:30363
LAL-					
85-09	NTIS (US Sales Only), PC A08/MF A01		DE86751347	MN -34D	11:30836
85-27	NTIS (US Sales Only), PC A05/MF A01		DE86751355	MN -34D	11:30837
85-29	NTIS (US Sales Only), PC A05/MF A01		DE86751601	MN -34D	11:30873
85-32	NTIS (US Sales Only), PC A02/MF A01		DE86751357	MN -34D	11:30838
85-34	NTIS (US Sales Only), PC A02/MF A01		DE86751373	MN -34C	11:30839
85-35	NTIS (US Sales Only), PC A02/MF A01		DE86751599	MN -34D	11:30874
85-37	NTIS (US Sales Only), PC A02/MF A01		DE86751356	MN -34D	11:30840
LAL-RT-					
85-08	NTIS (US Sales Only), PC A02/MF A01		DE86751353	MN -28	11:30420
85-09	NTIS (US Sales Only), PC A02/MF A01		DE86751354	MN -28	11:30421
LBL-					
17585	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE86009360	MN -95d	11:30000
18306	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009904	MN -95d	11:30001
18732	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009896	MN -95d	11:30002
18914	Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, PA 15096		TI86009909	ND -96	11:30033
19406	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009922	MN -25	11:30342
20020	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009343	MN -11	11:30747
20348	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009947	MN -95d	11:30003
20485	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009361	MN -25	11:30100
20654	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009223	STD -11	11:30537
20664	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009362	MN -37	11:30425
20738	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009265	STD -11	11:29405
20816	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009358	MN -94c	11:29902
20950	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009394	MN -95d	11:30004
20979	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86007484	MN -21	11:30409
21111	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE86009907	MN -92a	11:29235
21126	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009926	MN -34B	11:30783
21165	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009356	MN -34C	11:30937
21174	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009921	MN -20g	11:31077
21214	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009925	MN -25	11:30161
21255	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009949	MN -28	11:30410
21260	NTIS, PC A13/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009952	MN -34	11:30814
21299	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009363	MN -4	11:30324
LBL-PUB-					
3054	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009903	MN -38	11:30343
LC-					
78-600019	*See* GS-CIRC-79				11:29401
LP-					
199	NTIS (US Sales Only), PC A03/MF A01		DE86751588	MN -20f	11:30976
201	NTIS (US Sales Only), PC A03/MF A01		DE86751587	MN -34A	11:30977
LPNHEP-T-					
84-01	NTIS (US Sales Only), PC A12/MF A01		DE86751595	MN -34D	11:30841
MEA-					
2090-Vol.1	*See* NUREG/CP-0067-Vol.1		TI86901353	MN -78	11:29751
2090-Vol.2	*See* NUREG/CP-0067-Vol.2		TI86901354	MN -78	11:29752

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
2113	*See* NUREG/CR-4437		TI86900380	MN -80	11:30103
MES-					
84-35	*See* STEV-FBA-85-15		DE86751676	MN -90i	11:29200
MLM-					
3347	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010330	STD -4	11:30196
N-					
86-14303	NTIS, PC A03/MF A01				11:30101
86-14532	NTIS, PC A03/MF A01				11:30034
86-16221	NTIS, PC A02/MF A01				11:30035
86-16258	NTIS, PC A02/MF A01				11:29785
86-16269	NTIS, PC A03/MF A01				11:30121
86-16334	NTIS, PC A03/MF A01				11:29786
86-16551	NTIS, PC A06/MF A01				11:30310
86-16552	NTIS, PC A05/MF A01				11:30426
86-16599	NTIS, PC A03/MF A01				11:30122
86-16726	NTIS, PC A05/MF A01				11:29515
86-16748	NTIS, PC A09/MF A01				11:30538
86-16784	NTIS, PC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801				11:30181
86-16784	NTIS, PC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801				11:30539
86-16796	NTIS, PC A04/MF A01				11:30540
86-16945	NTIS, PC A03/MF A01				11:31280
86-17140	NTIS, PC A13/MF A01				11:30888
86-17239	NTIS, PC A03/MF A01				11:30784
86-17240	NTIS, PC A02/MF A01				11:30785
86-17255	NTIS, PC A04/MF A01				11:30786
86-17267	NTIS, PC A14/MF A01				11:30325
86-17472	NTIS, PC A02/MF A01				11:30123
86-17476	NTIS, PC A12/MF A01				11:30145
86-17477	NTIS, PC A02/MF A01				11:30144
86-17530	NTIS, PC A03/MF A01				11:30102
86-17731	NTIS, PC A02/MF A01				11:30364
86-17839	NTIS, PC A13/MF A01				11:29516
86-17997	NTIS, PC A03/MF A01				11:31282
86-17998	NTIS, PC A02/MF A01				11:31283
NAL-SP-					
3	*See* N-86-17267				11:30325
NAL-TR-					
858	*See* N-86-14303				11:30101
NAS-NS-					
3063	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007600	MN -4	11:30311
3116	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99:	DE86007601	MN -4	11:30312
NASA-CP-					
2408	*See* N-86-17839				11:29516
NASA-CR-					
171905	*See* N-86-16551				11:30310
174994	*See* DOE/NASA-0351-1	E 1.99:	DE86009863	STD -96	11:30049
176475	*See* N-86-17240				11:30785
178458	*See* N-86-16269				11:30121
178571	*See* N-86-16726				11:29515
NASA-RP-					
1143	*See* N-86-16748				11:30538
1157	*See* N-86-17140				11:30888
NASA-TM-					
87189	*See* N-86-16258				11:29785
87204	*See* N-86-17477				11:30144
87210	*See* N-86-16334				11:29786
87216	*See* N-86-16221				11:30035
87219	*See* N-86-17472				11:30123
87222	*See* N-86-16599				11:30122
87261	*See* DOE/NASA/50112-64	E 1.99:	DE86008113	STD -96	11:30091
87559	*See* N-86-16796				11:30540
87636	*See* N-86-16552				11:30426
NBSIR-					
86-3325	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010214	MN -59B	11:29612
86-3346	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010215	MN -59A	11:29600
NEANDC(E)-					
262-U-Vol.3-EURATOM	NTIS (US Sales Only), PC A06/MF A01; 1		DE86901253	MN -34C	11:30891
NEANDC(G)-					
103/ U	*See* JAERI-M-84-117		DE84901729	MN -34D	11:30913
NEANDC(J)-					
104/ U	*See* JAERI-M-84-163		DE84901850	MN -34C	11:30899
105/ U	*See* JAERI-M-84-165		DE84901864	MN -34C	11:30900
108/ AU	*See* JAERI-M-84-198		DE85901060	MN -34C	11:30901
109/ U	*See* JAERI-M-84-204		DE85900705	MN -34C	11:30902
110/ U	*See* JAERI-M-84-226		DE85901057	MN -34C	11:30903
NMERDI-					
2-73-4316	NTIS, PC A11/MF A01; 1 - NMERDI, 117 Richmond Dr., NE, Albuquerque, NM 87106		DE86901305	MN -92a	11:29236

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
NP-					
6751693	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751693	MN -13	11:29921
6751694	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751694	MN -13	11:29922
6751695	NTIS (US Sales Only), PC A02; 3		DE86751695	MN -13	11:29923
6751696	NTIS (US Sales Only), PC A02; 3		DE86751696	MN -13	11:29924
6751697	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751697	MN -13	11:29925
6751698	NTIS (US Sales Only), PC A08/MF A01; 1		DE86751698	MN -11	11:29906
6751699	NTIS (US Sales Only), PC A03/MF A01; 1		DE86751699	MN -13	11:29926
6751700	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751700	MN -13	11:29927
6751701	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751701	MN -13	11:29928
6751702	NTIS (US Sales Only), PC A04/MF A01; 1		DE86751702	MN -95d	11:30012
6751703	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751703	MN -13	11:29929
6751704	NTIS (US Sales Only), PC A02; 3		DE86751704	MN -13	11:29930
6751705	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751705	MN -13	11:29931
6751706	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751706	MN -13	11:29932
6751707	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751707	MN -13	11:29933
6751711	NTIS (US Sales Only), PC A11/MF A01; 1		DE86751711	MN -96	11:30062
6751712	NTIS (US Sales Only), PC A09/MF A01; 1		DE86751712	MN -11	11:30541
6751713	NTIS (US Sales Only), PC A09/MF A01; 1		DE86751713	MN -96	11:30063
6751714	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751714	MN -13	11:29937
6751715	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751715	MN -13	11:29934
6751716	NTIS (US Sales Only), PC A04/MF A01; 1		DE86751716	MN -13	11:29935
6751718	NTIS (US Sales Only), PC A08/MF A01; 1		DE86751718	MN -95d	11:30013
6751720	NTIS (US Sales Only), PC A08/MF A01; 1		DE86751720	MN -92	11:29938
6751723	NTIS (US Sales Only), PC A05/MF A01; 1		DE86751723	MN -11	11:30542
6901179	Scicon Ltd., 49 Berners St., London W1P 4AQ		TI86901179	ND -70	11:29440
6901285	Software Certification Institute, Box 2328, Santa Maria, CA 93455		TI86901285	ND -2	11:29846
NUREG-					
0020-Vol.10-No.3	NTIS, PC A19/MF A01 - GPO		TI86901356	MN -80	11:29789
0781	NTIS, PC A99/MF A01 - GPO		TI86901301	MN -78	11:29847
0985-Rev.2	NTIS, PC A04/MF A01 - GPO		TI86901355	MN -80	11:29848
1168	NTIS, PC A09/MF A01 - GPO		TI86901173	MN -70	11:29300
1181	NTIS, PC A22/MF A01 - GPO		TI86901346	MN -78	11:29773
1188	NTIS, PC A03/MF A01 - GPO		TI86901300	MN -70	11:29408
1192	NTIS, PC A03/MF A01 - GPO		TI86901343	MN -78	11:29849
NUREG/CP-					
0067-Vol.1	NTIS, PC A21/MF A01 - GPO		TI86901353	MN -78	11:29751
0067-Vol.2	NTIS, PC A22/MF A01 - GPO		TI86901354	MN -78	11:29752
NUREG/CR-					
2675-Vol.5	NTIS PC E12/MF A01 - GPO		TI86010247	MN -70B	11:29446
3064-Vol.2	NTIS, PC A04/MF A01 - GPO		TI86009493	MN -80	11:29821
3137	NTIS, PC A04/MF A01 - GPO		TI86008600	MN -80	11:29850
3365	NTIS, PC A06/MF A01 - GPO		TI86009373	MN -41	11:29851
3517	NTIS, PC A08/MF A01 - GPO		TI86009596	MN -80	11:29852
3965	NTIS, PC A05/MF A01 - GPO		TI86009816	MN -77	11:30162
4016-Vol.1	NTIS, PC A04/MF A01 - GPO		TI86003784	MN -80	11:29853
4022	NTIS, PC A99/MF A01 - GPO		TI86004581	MN -78	11:29774
4047	NTIS, PC A14/MF A01 - GPO		TI86008422	MN -78	11:29854
4330-Vol.1	NTIS, PC A05/MF A01 - GPO		TI86009678	MN -78	11:29753
4332	NTIS, PC A03/MF A01 - GPO		TI86008542	MN -78	11:29855
4338	NTIS, PC A02/MF A01 - GPO		TI86007761	MN -78	11:29856
4348-Vol.1	NTIS, PC A08/MF A01 - GPO		TI86005237	MN -80	11:29800
4348-Vol.2	NTIS, PC A10/MF A01 - GPO		TI86005238	MN -80	11:29801
4380	NTIS, PC A14/MF A01 - GPO		TI86005188	MN -80	11:29802
4412	NTIS, PC A04/MF A01 - GPO		TI86010225	MN -78	11:29857
4436-Vol.2	NTIS, PC A07/MF A01 - GPO		TI86008835	MN -80	11:29792
4437	NTIS, PC A05/MF A01 - GPO		TI86900380	MN -80	11:30103
4449	NTIS, PC A10/MF A01 - GPO		TI86008928	MN -78	11:29858
4489	NTIS, PC A08/MF A01 - GPO		TI86008412	MN -78	11:29859
4505	NTIS, PC A07/MF A01; 1 - GPO		TI86009372	MN -80	11:29860
4520	NTIS, PC A07/MF A01 - GPO		TI86010248	MN -70A	11:29441
4557	NTIS, PC A10/MF A01 - GPO		TI86007668	MN -80	11:29803
4568	NTIS, PC A06/MF A01 - GPO		TI86009575	MN -80	11:29788
4579	NTIS, PC A04/MF A01 - GPO		TI86901252	MN -80	11:30104
NUS-					
4724	NTIS, PC A16/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009740	MN -85	11:29301
NYSERDA-					
84-8	New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223		TI86901097	MN -66	11:29617
85-20	NYSERDA, Dept. of Communications, Two Rockefeller Plaza, Albany, NY 12223		TI86901303	MN -95d	11:30014
ORNL-					
6148	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010064	MN -70	11:30741
6226	*See* NUREG/CR-4350		TI86005188	MN -80	11:29802
6248	NTIS, PC A10/MF A01 (GPO Dep.)	E 1.99:	DE86005346	STD -48	11:30720
6259	*See* NUREG/CR-4489		TI86008412	MN -78	11:29859
6264	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009998	MN -90	11:29152
6271	NTIS, PC A15/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010066	MN -11	11:30584
ORNL/FMP-					
86/1	NTIS, PC A18/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009997	MN -90	11:29167
ORNL/M-					
149	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009959	MN -95d	11:30015

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
157	NTIS, PC A18/MF A01; 1 (GPO Dep.)	E 1.99: DE86010007	MN -34C	11:30411
ORNL/Sub-				
84-19712/ 1	NTIS, PC A05/MF A01 (GPO Dep.)	E 1.99: DE86010074	MN -95d	11:30498
84-97333/ 1	NTIS, PC A07/MF A01 (GPO Dep.)	E 1.99: DE86010079	MN -95d	11:30016
ORNL/TM-				
9408	*See* NUREG/CR-4022	TI86004581	MN -78	11:29774
9444	*See* NUREG/CR-4047	TI86008422	MN -78	11:29854
9680-Pt.2	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010075	STD -70	11:29409
9720	*See* NUREG/CR-4332	TI86008542	MN -78	11:29855
9726	*See* NUREG/CR-4338	TI86007761	MN -78	11:29856
9868	*See* NUREG/CR-4449	TI86008928	MN -78	11:29858
9903	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE86009995	MN -95	11:30124
9913	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86010078	STD -86	11:29295
9918	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86008416	MN -41	11:30737
9926	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99: DE86010068	STD -86	11:29296
9958	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86009911	MN -10	11:30313
9968-Vol.2	*See* NUREG/CR-3064-Vol.2	TI86009493	MN -80	11:29821
9988	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99: DE86010062	MN -70	11:30314
10018	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86010269	MN -61G	11:29546
PATENTS-US-	(US: Commissioner of Patents, Washington, D.C. 20231, USA, $1.00 per copy. Government Patent Applications available from NTIS)			
4,526,741				11:29755
4,528,939				11:30112
4,529,127				11:30022
4,529,571				11:30668
4,529,670				11:29904
4,529,710				11:30549
4,529,837				11:30358
4,529,856				11:30128
4,529,857				11:30129
4,529,943				11:30504
4,529,944				11:30369
4,536,203				11:30127
4,536,883				11:30503
4,537,475				11:30366
4,537,740				11:29875
4,537,741				11:29808
4,537,818				11:30419
4,538,274				11:30367
4,538,277				11:30368
4,539,846				11:29807
4,539,917				11:29265
4,540,203				11:29248
4,540,304				11:30110
4,540,503				11:29249
4,540,640				11:29986
4,540,642				11:29903
4,540,664				11:30267
4,540,960				11:30403
4,541,287				11:30109
4,543,213				11:29242
4,543,230				11:30492
4,543,233				11:29782
4,543,345				11:30126
4,545,679				11:30516
4,546,620				11:30018
4,547,080				11:29624
4,547,293				11:30031
4,547,432				11:29610
4,548,048				11:30030
4,548,053				11:30017
4,548,266				11:30405
4,548,876				11:29984
4,548,877				11:29985
4,549,110				11:30402
4,549,155				11:30357
4,550,014				11:30172
4,563,660				11:30401
4,565,926				11:30479
4,566,084				11:29232
4,569,484				11:29224
4,569,623				11:30356
4,572,003				11:30502
4,572,285				11:30404
4,572,618				11:30171
4,572,738				11:30107
4,572,812				11:30170
4,572,939				11:30108
4,572,964				11:30400
4,574,168				11:30501
PB-				
86-902801	Curr. Energy Pat., 86: No. 1, vp(Jan 1986)			11:31274

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
PCCF-T-					
84-03	NTIS (US Sales Only), PC A07/MF A01		DE86751348	MN -34D	11:30842
PNL-					
4241-Vol.5	*See* NUREG/CR-2675-Vol.5		TI86010247	MN -70B	11:29446
4758	*See* NUREG/CR-3365		TI86009373	MN -41	11:29851
4865	*See* NUREG/CR-3517		TI86009596	MN -80	11:29852
5506	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009729	MN -70	11:30604
5601	*See* NUREG/CR-4412		TI86010225	MN -78	11:29857
5629	NTIS, PC A08/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009732	MN -62	11:29601
5641-Vol.2	*See* NUREG/CR-4436-Vol.2		TI86008835	MN -80	11:29792
5646	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009890	MN -38	11:30344
5731	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009879	MN -85	11:29302
5745	NTIS, PC A06/MF A01 (GPO Dep.)	E 1.99:	DE86009039	MN -70	11:29410
5750-Pt.1	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009671	MN -48	11:30696
5777-Vol.1	NTIS, PC A14/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010253	STD -85	11:29303
5788	*See* NUREG/CR-4520		TI86010248	MN -70A	11:29441
5801	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010259	MN -61D	11:29486
5809-Vol.1	*See* NUREG/CR-4330-Vol.1		TI86009678	MN -78	11:29753
5812	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009938	MN -13	11:31272
5841	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009731	MN -70	11:29450
PNL-SA-					
13067	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010219	MN -25	11:30105
13395	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010222	MN -71	11:29304
13396	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010220	MN -70	11:29411
13733	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010221	MN -70	11:29412
PPPL-					
2268	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009757	STD -20d	11:30978
2270	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009751	STD -20g	11:31078
2272	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009750	STD -20f	11:30979
2284	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009758	STD -20f	11:30980
2314	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009753	STD -20a	11:30981
2320	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009749	STD -20b	11:31079
PTB-Me-					
58	NTIS (US Sales Only), PC A20/MF A01; 1		DE86751708	MN -38	11:29253
RAL-					
85-006	Rutherford Appleton Lab., Chilton, Didcot, Oxon, England		TI86901153	ND -38	11:30329
85-056	Rutherford Appleton Laboratory Chilton, Didcot, Oxon, OX11 OQX, England		TI86901218	ND -34D	11:30885
85-057	Rutherford Appleton Laboratory, Chilton, Didcot, Oxon, OX11 OQX, England		TI86901224	ND -34D	11:30886
85-076	NTIS (US Sales Only), PC A02/MF A01		DE86701792	MN -34D	11:30843
85-077	NTIS (US Sales Only), PC A03/MF A01		DE86701785	MN -34D	11:30875
85-080	NTIS (US Sales Only), PC A02/MF A01		DE86701797	MN -46	11:30949
85-083	NTIS (US Sales Only), PC A03/MF A01		DE86701770	MN -34B	11:30788
85-084	NTIS (US Sales Only), PC A02/MF A01		DE86701771	MN -34B	11:30789
85-086	NTIS (US Sales Only), PC A09/MF A01		DE86701774	MN -34B	11:30790
85-091	NTIS (US Sales Only), PC A02/MF A01		DE86701794	MN -34D	11:30844
REPT-					
613	*See* N-86-17140				11:30888
42977-6002-UT-00	*See* N-86-16726				11:29515
RFP-					
3871	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009786	STD -70	11:29413
RHO-BW-SA-					
344-P	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009864	MN -70	11:29414
RHO-BW-ST-					
73-P	NTIS, PC A09/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009902	MN -70	11:29415
RHO-RE-PL-					
34-P	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009208	MN -70	11:29416
RHO-RE-SA-					
116-P	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009591	MN -11	11:30616
RHO-RE-SR-					
85-24-P	NTIS, PC A07/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009175	MN -70	11:30617
RRK-					
84-24	NTIS (US Sales Only), PC A02/MF A01		DE86701778	MN -34B	11:30805
SAE-TP-					
840434	Warrendale, PA; Society of Automotive Engineers, Inc. (1984).				11:30045
841339	Warrendale, PA; Society of Automotive Engineers, Inc. (1984).				11:30043
841345	Warrendale, PA; Society of Automotive Engineers, Inc. (1984).				11:30044
841384	Warrendale, PA; Society of Automotive Engineers, Inc. (1984).				11:30046
SAND-					
83-1982C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009468	MN -70	11:29417
85-0123C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007826	MN -70	11:30749
85-0855	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009981	MN -70	11:30742
85-0957	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009542	MN -60	11:29664
85-1016	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009669	STD -71	11:29305
85-1616C	NTIS, PC A02/MF A01 - GPO (GPO Dep.)	E 1.99:	TI86009861	MN -78	11:29861
85-1804C	NTIS, PC A02; 3		DE86009286	MN -38	11:30345
85-1840C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86005438	MN -38	11:30346
85-2075C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007832	MN -92a	11:29251

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
85-2103C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86000206	MN -80	11:29822
85-2124C	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009024	MN -11	11:30750
85-2152C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86002118	MN -80	11:29823
85-2237C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007390	MN -70	11:30751
85-2238C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007147	MN -70	11:30752
85-2273C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007388	MN -70	11:30753
85-2389	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009274	STD -32	11:31284
85-2446C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009851	MN -25	11:30163
85-2511	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009986	MN -32	11:31285
85-2550C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86005435	MN -38	11:30330
85-2712C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009623	MN -66d	11:29623
85-2843	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009558	MN -66	11:29639
85-7007	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009819	STD -62b	11:29607
85-7243	NTIS, PC A06/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009546	MN -71	11:30347
86-0009	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009557	MN -15	11:29454
86-0017C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86004988	MN -21	11:31080
86-0027C	NTIS, PC A02/MF A01 - GPO		TI86005441	MN -78	11:29862
86-0051C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86005631	MN -71	11:30348
86-0052C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86005629	MN -71	11:30349
86-0053C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86005436	MN -71	11:29306
86-0056C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86005437	MN -71	11:30350
86-0057C	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86008780	MN -20a	11:31081
86-0065	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE86010309	MN -4	11:30164
86-0079C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009090	MN -38	11:30386
86-0088C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86005626	MN -38	11:30387
86-0238	NTIS, PC A06/MF A01; 1		DE86009980	ND -92	11:30754
86-0249	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009985	MN -32	11:31286
86-0255C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009379	MN -80	11:29863
86-0277C	NTIS, PC A02; 3		DE86009378	MN -80	11:29864
86-0283	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86006472	MN -20	11:30982
86-0303C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009628	MN -62c	11:29608
86-0412C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007394	MN -70	11:30755
86-0476C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86007825	MN -78	11:29813
86-0916C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009639	MN -38	11:30351
86-0966C	NTIS, PC A02; 3		DE86009636	MN -38	11:30352
86-1024C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009850	MN -25	11:30388
86-1088C	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86010095	MN -70	11:29307
86-8007	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009875	MN -62a	11:29609
86-8219	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009984	MN -25	11:30389
SANL-					
231-003	*See* UCRL-15790	E 1.99:	DE86009689	MN -11	11:30761
SCIPP-					
85/ 48	*See* SLAC-PUB-3845	E 1.99:	DE86009782	MN -34D	11:30845
SERI/TP-					
250-2933	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86004447	MN -59B	11:29602
252-2919	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86004444	MN -59A	11:29603
SERI/TR-					
252-2704	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86004439	MN -59A	11:29604
SLAC-CN-					
326	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010092	MN -28	11:30414
SLAC-PUB-					
3845	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009782	MN -34D	11:30845
3867	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86006954	MN -37	11:30499
3902	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009198	MN -34D	11:30887
3904	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009199	MN -34D	11:30846
SNV-PM-					
1997	NTIS (US Sales Only), PC A05/MF A01		DE86751681	MN -61	11:29547
SOL-					
86-3	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009867	MN -32	11:30961
SPh-T-					
85-085	*See* CEA-CONF-8028		DE86751365	MN -34D	11:30956
85-105	*See* CEA-CONF-8070		DE86751364	MN -34D	11:30849
SRD-R-					
276	UKAEA, Wigshaw Lane, Culcheth, Warrington WA3 4NE England		TI86901204	ND -41	11:29865
297	United Kingdom Atomic Energy Authority, Wigshaw Lane, Culcheth, Warrington WA3 4NE England 7.00 po		TI86901199	ND -41	11:30563
325	United Kingdom Atomic Energy Authority, Wigshaw Lane, Culcheth, Warrington WA3 4NE England		TI86901196	ND -41	11:30544
SRDP-R-					
114	*See* AEEW-R-1925		TI86901177	ND -15	11:29451
STEV-BF-					
85-8	NTIS (US Sales Only), PC A03/MF A01; 1		DE86751674	MN -89	11:29168
85-16	NTIS (US Sales Only), PC A07/MF A01; 1		DE86751686	MN -61	11:29153
86-1	NTIS (US Sales Only), PC A03/MF A01; 1		DE86751687	MN -90c	11:29169
86-2	NTIS (US Sales Only), PC A03/MF A01; 1		DE86751688	MN -91	11:29275
STEV-FBA-					
85-15	NTIS (US Sales Only), PC A03/MF A01		DE86751676	MN -90i	11:29200
STEV-FVE-					
85-1	NTIS (US Sales Only), PC A07/MF A01		DE86751675	MN -95	11:29918
85-4	NTIS (US Sales Only), PC A02/MF A01		DE86751689	MN -94a	11:29877

Report Number	Availability Source	File Number		Distribution Category	Abstract Number
STEV-TORV-					
85-17	NTIS (US Sales Only), PC A03/MF A01; 1		DE86751673	MN -88	11:29203
86-2	NTIS (US Sales Only), PC A05/MF A01; 1		DE86751690	MN -90b	11:29212
86-3	NTIS (US Sales Only), PC A04/MF A01		DE86751691	MN -90b	11:29213
STEV-VIND-					
85-15	NTIS (US Sales Only), PC A02/MF A01; 1		DE86751680	MN -60	11:29644
85-17	NTIS (US Sales Only), PC A04/MF A01; 1		DE86751679	MN -60	11:29665
85-25	NTIS (US Sales Only), PC A03/MF A01; 1		DE86751678	MN -60	11:29666
85-28	NTIS (US Sales Only), PC A02/MF A01		DE86751677	MN -60	11:29667
85-41	NTIS (US Sales Only), PC A06/MF A01; 1		DE86751692	MN -60	11:29668
STUDSVIK-EB-					
85-72	*See* STEV-BF-85-16		DE86751686	MN -61	11:29153
STUDSVIK-EI-					
85-122	*See* STEV-FVE-85-4		DE86751689	MN -94a	11:29877
TELEVERKET-RF-					
84-001	*See* STEV-VIND-85-15		DE86751680	MN -60	11:29644
TG-					
84-06	*See* STEV-VIND-85-17		DE86751679	MN -60	11:29665
TKK-KO/PM-					
41	NTIS (US Sales Only), PC A12/MF A01; 1		DE86751657	MN -96	11:30037
44	NTIS (US Sales Only), MF A01; 2		DE86751655	MN -96	11:30038
45	NTIS (US Sales Only), PC A07/MF A01; 1		DE86751656	MN -96	11:30039
46	NTIS (US Sales Only), PC A03/MF A01; 1		DE86751654	MN -96	11:30040
47	NTIS (US Sales Only), PC A07/MF A01; 1		DE86751653	MN -96	11:30041
49	NTIS (US Sales Only), PC A04/MF A01; 1		DE86751651	MN -96	11:30042
TPR-NS-					
27-No.2	GPO, $6.00		TI86006671	ND -41	11:29866
TRI-PP-					
86-2	NTIS (US Sales Only), PC A02/MF A01; 1		DE86901244	MN -28	11:30416
86-3	NTIS (US Sales Only), PC A02/MF A01; 1		DE86901243	MN -28	11:30417
86-5	NTIS (US Sales Only), PC A02/MF A01		DE86901242	MN -28	11:30418
TTC-					
645	*See* SAND-86-0052C	E 1.99:	DE86005629	MN -71	11:30349
0558	*See* SAND-85-1016	E 1.99:	DE86009669	STD -71	11:29305
0590	*See* SAND-86-0056C	E 1.99:	DE86005437	MN -71	11:30350
0600	*See* SAND-86-0053C	E 1.99:	DE86005436	MN -71	11:29306
0611	*See* SAND-85-7243	E 1.99:	DE86009546	MN -71	11:30347
0644	*See* SAND-86-0051C	E 1.99:	DE86005631	MN -71	11:30348
TVA/OACD-					
85/ 9	NTIS, PC A02/MF A01		DE86901274	MN -13	11:30686
85/ 11	NTIS, PC A02/MF A01		DE86901289	MN -13	11:30687
85/ 13	NTIS, PC A06/MF A01		DE86901276	MN -13	11:30688
6901287	NTIS, PC A03/MF A01; 1		DE86901287	MN -13	11:30689
TVA/ONRED/AWR-					
85/ 7	NTIS, PC A05/MF A01; 1		DE86901131	MN -11	11:29495
85/ 32	NTIS, PC A04/MF A01; 1		DE86901268	MN -11	11:30743
TVA/OP/FHP-					
86/ 3	NTIS, PC A02/MF A01; 1		DE86901275	MN -98A	11:29682
TVA/PE/EDT-					
85/ 24	NTIS, PC A03/MF A01; 1		DE86901267	MN -78	11:29867
UCID-					
20616	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009619	MN -38	11:30331
20622-86-3	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009891	MN -25	11:30175
20673	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008103	MN -11	11:29418
20689	NTIS, PC A03/MF A01 (GPO Dep.)	E 1.99:	DE86009347	MN -11	11:30518
20719	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009933	MN -38	11:30500
20721	NTIS, PC A04/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009934	MN -32	11:31287
20732	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009935	MN -20g	11:30983
UCRL-					
15790	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009689	MN -11	11:30761
92562-Rev.1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009716	MN -32	11:30959
93207	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009717	MN -38	11:29564
93421	NTIS, PC A02; 3		DE86009699	MN -85	11:30756
93422	NTIS, PC A02; 3		DE86008767	MN -85	11:30757
93429	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008029	MN -92a	11:29252
93549	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009722	MN -34B	11:30810
93600	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86003470	MN -38	11:30353
93776	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009693	MN -41	11:30951
93834-Rev.1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009386	MN -20a	11:31082
93878-Rev.1	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009894	MN -20	11:30984
93950	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009407	MN -21	11:31083
93970	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009405	MN -20a	11:30985
94019	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86007178	MN -93	11:30407
94075	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86006916	MN -92	11:29250
94207-Rev.1	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009609	STD -20g	11:30986
94208	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009713	MN -38	11:30354
94226	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008021	MN -11	11:30545
94286	NTIS, PC A02; 3		DE86009720	MN -20d	11:31084
94310	NTIS, PC A02/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009695	MN -32	11:31288
94338	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86008764	MN -11	11:30519
94340	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009698	MN -32	11:31289
94428	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99:	DE86009392	MN -11	11:30697
94467	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86009892	MN -13	11:30315
94518	NTIS, PC A02/MF A01 (GPO Dep.)	E 1.99:	DE86010158	MN -13	11:31273

Report Number	Availability Source	File Number	Distribution Category	Abstract Number
USGS/MAP/I-				
159-B	USGS Open File Services, Box 25425, Federal Center, Denver, CO 80225	TI86900447	MN -11	11:29288
USGS-OFR-				
83-475	*See* UCRL-15790	E 1.99: DE86009689	MN -11	11:30761
86-46	NTIS, PC A04/MF A01 (GPO Dep.)	E 1.99: DE86010153	STD -70	11:30748
USGS-PP-				
1329	NTIS, PC A05/MF A01; 1 (GPO Dep.)	E 1.99: DE86008699	MN -70	11:30744
USGS/WRI-				
84-4296	NTIS, PC A03/MF A01; 1 (GPO Dep.)	E 1.99: DE86008811	MN -11	11:30745
UWThPb-				
85-19	NTIS (US Sales Only), PC A02/MF A01	DE86701772	MN -34B	11:30806
85-23	NTIS (US Sales Only), PC A02/MF A01	DE86701786	MN -34D	11:30876
85-24	NTIS (US Sales Only), PC A03/MF A01	DE86701781	MN -34D	11:30877
85-27	NTIS (US Sales Only), PC A02/MF A01	DE86701773	MN -34B	11:30807
VTT-TIED-				
513	NTIS (US Sales Only), PC A04/MF A01; 1	DE86751672	MN -61	11:29490
VTT-TUTK-				
379	NTIS (US Sales Only), PC A05/MF A01; 1	DE86751671	MN -61	11:29491
WAOENG-				
85-49	Washington State Energy Office, 400 East Union, Olympia, WA 98504	TI86901217	MN -59B	11:29605
86-03	WSEO, 400 East Union, Olympia, WA 98504	TI86901216	MN -59B	11:29606
WAPD-TM-				
1278	NTIS, PC A10/MF A01; 1 (GPO Dep.)	E 1.99: DE86009977	STD -78	11:29781
Y/DV-				
420	NTIS, PC A11/MF A01; 1 (GPO Dep.)	E 1.99: DE86010139	MN -25	11:30106

FILE NUMBER CORRELATION

This correlation list is provided for those organizations where document storage is alphanumeric by report number and request may be received by file number. For other information about a document (abstract number, distribution category, availability, and price), please refer to the Report Number Index.

File No.	Report No.
DE84901010	AECL—7813
DE84901729	JAERI-M—84-117
DE84901834	AECL—7827
DE84901835	AECL—7805
DE84901836	AECL—7824
DE84901850	JAERI-M—84-163
DE84901864	JAERI-M—84-165
DE85016048	DOE/NV/10081—3-Pts.1-2
DE85017545	LA-UR—85-2954
DE85900232	AECL—8374
DE85900379	AECL—7821
DE85900380	AECL—7809
DE85900454	AECL—8365
DE85900455	AECL—8364
DE85900459	AECL—8380
DE85900464	AECL—7811
DE85900683	AECL—8375
DE85900684	AECL—7819
DE85900685	AECL—8366
DE85900705	JAERI-M—84-204
DE85901057	JAERI-M—84-226
DE85901060	JAERI-M—84-198
DE85901164	AECL—7816
DE85901220	AECL—8376
DE85901265	AECL—8371
DE86000206	SAND—85-2103C
DE86000279	DOE/BC/10830—3
DE86000283	DOE/MC/21136—6
DE86000764	LA-UR—85-3264
DE86000802	LA-UR—85-3420
DE86000805	LA-UR—85-3389
DE86000807	LA-UR—85-3375
DE86000810	LA-UR—85-3347
DE86002118	SAND—85-2152C
DE86002383	LA-UR—85-3554
DE86003047	CONF-860635—1
DE86003077	CONF-860604—2
DE86003086	CONF-860610—1
DE86003227	EGG-M—27784
DE86003470	UCRL—93600
DE86003681	LA-UR—85-3958
DE86003718	DOE/METC—86/2025
DE86004439	SERI/TR—252-2704
DE86004444	SERI/TP—252-2919
DE86004447	SERI/TP—250-2933
DE86004988	SAND—86-0017C
DE86005024	CONF-860610—3
DE86005346	ORNL—6248
DE86005383	CONF-860610—5
DE86005384	CONF-860622—1
DE86005385	CONF-860610—7
DE86005407	CONF-860676—1
DE86005435	SAND—85-2550C
DE86005436	SAND—86-0053C
DE86005437	SAND—86-0056C
DE86005438	SAND—85-1840C
DE86005495	DOE/PC/60802—10
DE86005512	CONF-860605—2
DE86005626	SAND—86-0088C
DE86005629	SAND—86-0052C
DE86005631	SAND—86-0051C
DE86005679	BNL—37407
DE86006071	CONF-860603—2
DE86006091	CONF-860610—9
DE86006123	CONF-860610—11
DE86006173	CONF-860610—10
DE86006213	CONF-860603—1
DE86006472	SAND—86-0283
DE86006603	DOE/METC—86/4060
DE86006815	K/PS—5068-EX
DE86006849	EGG—10282-1084
DE86006916	UCRL—94075
DE86006954	SLAC-PUB—3867
DE86007133	BNL—37685
DE86007147	SAND—85-2238C
DE86007156	CONF-860414—3
DE86007178	UCRL—94019
DE86007238	CONF-860605—3
DE86007240	CONF-860414—2
DE86007302	CONF-860610—19
DE86007303	CONF-860610—20
DE86007322	CONF-860610—21
DE86007325	DOE/OR/21400—T239
DE86007332	CONF-860610—22
DE86007372	LA-UR—86-733
DE86007374	LA-UR—86-679
DE86007377	LA-UR—86-641
DE86007387	LA-UR—86-273
DE86007388	SAND—85-2273C
DE86007390	SAND—85-2237C
DE86007394	SAND—86-0412C
DE86007484	LBL—20979
DE86007513	CONF-860605—8
DE86007518	CONF-860605—7
DE86007521	CONF-860605—6
DE86007600	NAS-NS—3063
DE86007601	NAS-NS—3116
DE86007635	EGG-M—05585
DE86007760	K/CSD/INF—86/5
DE86007804	EEG—32
DE86007825	SAND—86-0476C
DE86007826	SAND—85-0123C
DE86007832	SAND—85-2075C
DE86007958	DOE/PC/60039—8
DE86008000	CONF-860390—1
DE86008001	CONF-8506213—2
DE86008007	BNL—37768
DE86008021	UCRL—94226
DE86008029	UCRL—93429
DE86008045	DP-MS—85-138
DE86008099	DOE/ER/80108—T1
DE86008103	UCID—20673
DE86008113	DOE/NASA/50112—64
DE86008220	CONF-860161—1
DE86008228	CONF-8603100—1
DE86008234	CONF-860605—9
DE86008249	CONF-8506104—3
DE86008284	DOE/EI/06320—T3-Vol.3
DE86008285	DOE/EI/06320—T3-Vol.2-Pt.2
DE86008286	DOE/EI/06320—T3-Vol.2-Pt.1
DE86008287	DOE/EI/06320—T2
DE86008288	DOE/EI/06320—T3-Vol.1
DE86008310	DOE/BP/18966—1
DE86008416	ORNL/TM—9918
DE86008491	CONF-860605—10
DE86008500	CONF-860605—11
DE86008505	CONF-860693—1
DE86008540	CONF-860163—1
DE86008682	DOE/RL/02225—19
DE86008699	USGS-PP—1329
DE86008748	LA-UR—86-996
DE86008752	LA-UR—86-1011
DE86008764	UCRL—94338
DE86008767	UCRL—93422
DE86008780	SAND—86-0057C
DE86008811	USGS/WRI—84-4296
DE86008821	DOE/BP/11982—1
DE86008824	DOE/BP/20733—1
DE86008826	DOE/BP—582
DE86008828	DOE/BP/33825—1
DE86008885	CONF-8511179—1
DE86008893	DOE/ID—12106
DE86008900	DP-MS—85-120
DE86008902	DP-MS—85-140
DE86008904	DP-MS—85-119
DE86008914	DOE/BP/39644—1
DE86008919	DOE/EV/01525—T6
DE86008969	CONF-850836—11
DE86009024	SAND—85-2124C
DE86009034	DOE/ER/13259—T2
DE86009039	PNL—5745
DE86009079	EGG-M—18085
DE86009081	DOE/NV/10327—24
DE86009082	GA-A—18285
DE86009090	SAND—86-0079C
DE86009105	EGG-EP—7076
DE86009111	DOE/CE/40543—1
DE86009116	DOE/CE/40543—6
DE86009120	DOE/EIA—0185(85)
DE86009121	DOE/EIA—0455(84)
DE86009143	LA-tr—86-14
DE86009155	CONF-860605—13
DE86009175	RHO-RE-SR—85-24-P
DE86009181	ANL-HEP-CP—86-19
DE86009198	SLAC-PUB—3902
DE86009199	SLAC-PUB—3904
DE86009208	RHO-RE-PL—34-P
DE86009223	LBL—20654
DE86009231	DOE/ER/12015—T1
DE86009265	LBL—20738
DE86009274	SAND—85-2389
DE86009277	DOE/CS/60210—T1
DE86009286	SAND—85-1804C
DE86009296	DOE/PC/70811—5
DE86009307	DOE/PC/81210—T10
DE86009308	DOE/PC/60015—36
DE86009315	DOE/RA/50179—T1
DE86009317	DOE/ER/13112—3
DE86009327	DOE/SF/15799—T5
DE86009343	LBL—20020
DE86009347	UCID—20689
DE86009356	LBL—21165
DE86009358	LBL—20816
DE86009360	LBL—17585
DE86009361	LBL—20485
DE86009362	LBL—20664
DE86009363	LBL—21299
DE86009378	SAND—86-0277C
DE86009379	SAND—86-0255C
DE86009386	UCRL—93834-Rev.1
DE86009392	UCRL—94428
DE86009394	LBL—20950

File No.	Report No.
DE86009405	UCRL—93970
DE86009407	UCRL—93950
DE86009412	HEDL-SA—3467-FP
DE86009415	HEDL-SA—3291
DE86009417	HEDL-SA—3407-FP
DE86009428	BNL—37899
DE86009429	BNL—37844
DE86009442	BNL—37846
DE86009450	CONF-860604—7
DE86009451	CONF-860604—8
DE86009454	GEND—055
DE86009457	CONF-860204—41
DE86009458	CONF-8509147—18
DE86009460	CONF-8606111—3
DE86009461	CONF-8606111—1
DE86009462	CONF-8606111—2
DE86009465	DOE/PC/70803—T6
DE86009468	SAND—83-1982C
DE86009482	CONF-860652—4
DE86009484	CONF-860652—3
DE86009491	ANL/TM—436
DE86009502	CONF-860421—25
DE86009504	CONF-860170—2
DE86009511	CONF-860170—3
DE86009513	CONF-860413—1
DE86009516	DOE/ER/10434—6
DE86009517	DOE/ER/10690—6
DE86009518	DOE/PC/70802—T2
DE86009535	DOE/MI/01005—T1-Exec.Summ.
DE86009536	DOE/CH/10088—2018
DE86009542	SAND—85-0957
DE86009546	SAND—85-7243
DE86009557	SAND—85-0009
DE86009558	SAND—85-2843
DE86009566	DOE/PC/70799—T5
DE86009571	DP—1717
DE86009572	DP—1714
DE86009580	DOE/PC/80517—T1
DE86009583	DOE/PC/80532—3
DE86009591	RHO-RE-SA—116-P
DE86009593	DOE/PC/80530—T2
DE86009598	DOE/PC/70794—6
DE86009609	UCRL—94207-Rev.1
DE86009619	UCID—20616
DE86009623	SAND—85-2712C
DE86009628	SAND—86-0303C
DE86009632	DOE/ER/13234—2
DE86009635	DOE/BP/24574—2
DE86009636	SAND—86-0966C
DE86009639	SAND—86-0916C
DE86009663	ANL/TM—431-Rev.
DE86009665	ANL/TM—438
DE86009668	ANL/CNSV-TM—174
DE86009669	SAND—85-1016
DE86009671	PNL—5750-Pt.1
DE86009672	DOE/ER/40157—3
DE86009675	DOE/ER/03244—121
DE86009689	UCRL—15790
DE86009693	UCRL—93776
DE86009695	UCRL—94310
DE86009698	UCRL—94340
DE86009699	UCRL—93421
DE86009713	UCRL—94208
DE86009716	UCRL—92562-Rev.1
DE86009717	UCRL—93207
DE86009720	UCRL—94286
DE86009722	UCRL—93549
DE86009729	PNL—5506
DE86009731	PNL—5841
DE86009732	PNL—5629
DE86009735	K/OA—6004
DE86009738	DOE/PC/60787—10
DE86009740	NUS—4724
DE86009749	PPPL—2320
DE86009750	PPPL—2272
DE86009751	PPPL—2270
DE86009753	PPPL—2314
DE86009757	PPPL—2268
DE86009758	PPPL—2284
DE86009762	DOE/ER/10689—6
DE86009770	DOE/PC/70782—6
DE86009771	DOE/ER/40020—T2
DE86009772	DOE/PC/70801—T6
DE86009782	SLAC-PUB—3845
DE86009786	RFP—3871
DE86009792	LA—10645-PR
DE86009793	LA—10574-MS
DE86009794	LA—10659-HDR-Vol.1
DE86009797	LA—10449-MS
DE86009798	LA—10627-MS
DE86009800	DOE/ER/04928—13
DE86009801	DOE/ER/04928—12
DE86009802	DOE/ER/60158—2
DE86009804	DOE/ER/53206—T1
DE86009805	DOE/ER/04928—10
DE86009806	DOE/ER/04928—7
DE86009807	DOE/ER/04928—8
DE86009812	DOE/ER/04928—11
DE86009819	SAND—85-7007
DE86009823	DOE/PC/70006—9
DE86009824	DOE/PC/60800—10
DE86009828	DOE/SF/12197—T6
DE86009833	DOE/JPL/956679—84/6
DE86009837	DOE/PC/70796—8
DE86009841	DOE/PC/70061—7
DE86009845	DOE/PC/70771—T3
DE86009847	DOE/NV/10282—5013
DE86009849	DOE/PC/70781—T5
DE86009850	SAND—86-1024C
DE86009851	SAND—85-2446C
DE86009863	DOE/NASA—0351-1
DE86009864	RHO-BW-SA—344-P
DE86009867	SOL—86-3
DE86009868	DOE/NE/44352—1
DE86009872	FNAL/C—86/30
DE86009875	SAND—86-8007
DE86009879	PNL—5731
DE86009881	DOE/CE/50036—H1
DE86009884	DOE/ER/53134—T1
DE86009885	DOE/ER/53134—T2
DE86009887	GB—9
DE86009888	DOE/EIA—0333(86)
DE86009890	PNL—5646
DE86009891	UCID—20622-86-3
DE86009892	UCRL—94467
DE86009894	UCRL—93878-Rev.1
DE86009896	LBL—18732
DE86009902	RHO-BW-ST—73-P
DE86009903	LBL-PUB—3054
DE86009904	LBL—18306
DE86009907	LBL—21111
DE86009910	BNL—37817
DE86009911	ORNL/TM—9958
DE86009914	BNL—37891
DE86009916	BNL—37866
DE86009917	BNL—37898
DE86009919	BNL—37931
DE86009920	DOE/EV/04268—T5
DE86009921	LBL—21174
DE86009922	LBL—19406
DE86009925	LBL—21214
DE86009926	LBL—21126
DE86009928	DOE/ER/02944—9
DE86009933	UCID—20719
DE86009934	UCID—20721
DE86009935	UCID—20732
DE86009937	DOE/ER—0191/3
DE86009938	PNL—5812
DE86009939	BNL—37836
DE86009940	BNL—37948
DE86009944	BNL—37930
DE86009945	BNL—37962
DE86009946	DOE/ER/40085—10
DE86009947	LBL—20348
DE86009949	LBL—21255
DE86009952	LBL—21260
DE86009959	ORNL/M—149
DE86009965	DOE/ER/13022—3
DE86009969	LA-tr—85-58
DE86009973	DOE/CE/15192—T1
DE86009977	WAPD-TM—1278
DE86009980	SAND—86-0238
DE86009981	SAND—85-0855
DE86009984	SAND—86-8219
DE86009985	SAND—86-0249
DE86009986	SAND—85-2511
DE86009987	FNAL/Pub—86/57-A
DE86009988	FNAL/Pub—86/49-A
DE86009989	FNAL/Pub—86/38-A
DE86009990	FNAL/Pub—86/47-A
DE86009992	FNAL/Pub—86/36-A
DE86009993	FNAL/Pub—86/48-A
DE86009995	ORNL/TM—9903
DE86009997	ORNL/FMP—86/1
DE86009998	ORNL—6264
DE86010007	ORNL/M—157
DE86010010	DOE/EIA—0474(86)
DE86010012	DOE/PC/70792—T6
DE86010016	CONF-860412—8
DE86010018	CONF-860412—5
DE86010022	CONF-860412—6
DE86010025	CONF-860421—28
DE86010046	CONF-860695—1
DE86010062	ORNL/TM—9988
DE86010064	ORNL—6148
DE86010065	DOE/ER—0113/5
DE86010066	ORNL—6271
DE86010068	ORNL/TM—9926
DE86010074	ORNL/Sub—84-19712/1
DE86010075	ORNL/TM—9680-Pt.2
DE86010078	ORNL/TM—9913
DE86010079	ORNL/Sub—84-97333/1
DE86010092	SLAC-CN—326
DE86010093	DOE/PC/80911—T2
DE86010095	SAND—86-1088C
DE86010103	DOE/PC/50803—T1
DE86010106	DOE/ET/34072—4-Draft
DE86010134	DOE/SF/11918—T2
DE86010137	DOE/MC/19210—2043
DE86010139	Y/DV—420
DE86010150	DOE/CS/30475—T3
DE86010152	CONF-8509121—
DE86010153	USGS-OFR—86-46
DE86010155	DOE/PC/60791—9
DE86010158	UCRL—94518
DE86010173	LA-UR—86-1202
DE86010176	LA-UR—86-1233
DE86010193	LA-UR—86-1368
DE86010194	LA-UR—86-1378
DE86010195	LA-UR—86-1386
DE86010201	LA-UR—86-1420
DE86010210	GA-A—18414
DE86010211	DOE/CE/15192—T2
DE86010214	NBSIR—86-3325
DE86010215	NBSIR—86-3346
DE86010216	GA-A—18388
DE86010217	GA-A—18415
DE86010219	PNL-SA—13067
DE86010220	PNL-SA—13396
DE86010221	PNL-SA—13733
DE86010222	PNL-SA—13395
DE86010223	GA-A—18380
DE86010226	BMI/ONWI—587
DE86010234	DOE/ER/53140—24
DE86010235	DOE/ER/60134—2
DE86010236	DOE/ER/13260—T2
DE86010242	DOE/JPL/1012—112
DE86010243	DOE/JPL—1012-114
DE86010245	DOE/FE/55014—T20
DE86010246	DOE/FE/55014—T21
DE86010253	PNL—5777-Vol.1
DE86010255	BMI/ONWI—585
DE86010259	PNL—5801
DE86010269	ORNL/TM—10018
DE86010273	DOE/EIA—0380(86/02)
DE86010276	BDX—613-3262
DE86010278	GA-A—18412
DE86010283	DOE/ER/45113—2
DE86010284	DOE/ER/13456—1
DE86010285	DOE/ER/13394—1
DE86010287	DOE/ER/10803—5
DE86010298	BDX—613-3477
DE86010299	BDX—613-3476
DE86010309	SAND—86-0065
DE86010315	DP-MS—86-37
DE86010330	MLM—3347
DE86010338	DOE/ER/06030—T4
DE86010340	DOE/ER/02542—4
DE86010345	DOE/EI/10464—T2
DE86010368	DOE/ER/04392—8
DE86010370	DOE/ER/10980—4
DE86010376	DOE/EV/10359—T1
DE86701588	ENEA-RT-PAS—84-16
DE86701711	IC—84/232

File No.	Report No.
DE86701770	RAL—85-083
DE86701771	RAL—85-084
DE86701772	UWThPh—85-19
DE86701773	UWThPh—85-27
DE86701774	RAL—85-086
DE86701775	IC—85/35
DE86701776	IC—85/47
DE86701777	IFT-P—14/85
DE86701778	RRK—84-24
DE86701779	IC—85/38
DE86701781	UWThPh—85-24
DE86701782	IC—85/63
DE86701783	IC—85/42
DE86701784	IC—85/75
DE86701785	RAL—85-077
DE86701786	UWThPh—85-23
DE86701787	IC—84/247
DE86701788	IC—85/34
DE86701789	IC—85/66
DE86701790	IFUSP-P—544
DE86701791	INS—525
DE86701792	RAL—85-076
DE86701793	INIS-mf—10040
DE86701794	RAL—85-091
DE86701795	AREAEE—273
DE86701796	AREAEE—279
DE86701797	RAL—85-080
DE86701798	ANU-P—922
DE86701799	INS—518
DE86701800	IC—85/36
DE86701801	IC—85/45
DE86701802	INS—519
DE86701803	IC—85/74
DE86701804	INS—517
DE86701805	INS—520
DE86701807	INS—526
DE86701808	INS—522
DE86701809	INS—521
DE86701810	ANU-P—927
DE86701811	ANU-P—910
DE86701812	ANU-P—918
DE86701813	ANU-P—925
DE86701814	ANU-P—928
DE86701815	ANU-P—907
DE86701816	ANU-P—923
DE86701817	ANU-P—931
DE86701818	ANU-P—933
DE86701819	INIS-BR—453
DE86701820	INIS-BR—456
DE86751315	FRADOC—3-2
DE86751316	FRADOC—3-1
DE86751317	FRADOC—2-1
DE86751318	FRADOC—2-6
DE86751319	FRNC-TH—2128
DE86751320	IPNO-GEPL—83-13
DE86751321	GANIL-P—85-06
DE86751322	FRNC-TH—2131
DE86751323	EDF-DER-RA—1984
DE86751325	EUR—9651
DE86751326	EUR—9679
DE86751334	CEA-CONF—8047
DE86751335	CEA-CONF—8123
DE86751336	CEA-CONF—8100
DE86751337	CEA-CONF—8164
DE86751338	CEA-CONF—8147
DE86751339	EDF—84H531172
DE86751340	CEA-CONF—8124
DE86751341	CEA-R—5324
DE86751342	CEA-CONF—8032
DE86751343	CEA-CONF—8149
DE86751344	CEA-CONF—8142
DE86751345	CEA-R—5314
DE86751346	CEA-N—2454
DE86751347	LAL—85-09
DE86751348	PCCF-T—84-03
DE86751349	CEA-CONF—8049
DE86751350	CEA-CONF—8157
DE86751351	CEA-CONF—8050
DE86751352	CEA-CONF—8148
DE86751353	LAL-RT—85-08
DE86751354	LAL-RT—85-09
DE86751355	LAL—85-27
DE86751356	LAL—85-37
DE86751357	LAL—85-32
DE86751358	FRADOC—1-3
DE86751359	FRADOC—1-2
DE86751360	FRADOC—1-1
DE86751361	CEA-CONF—8151
DE86751362	CEA-CONF—8153
DE86751363	CEA-CONF—8130
DE86751364	CEA-CONF—8070
DE86751365	CEA-CONF—8028
DE86751366	CEA-CONF—8122
DE86751367	CEA-CONF—8052
DE86751368	FRNC-TH—2223
DE86751369	CEA-CONF—8131
DE86751370	CEA-CONF—8126
DE86751371	FRNC-TH—2074
DE86751372	FRNC-TH—2216
DE86751373	LAL—85-34
DE86751408	KFK—3826-B
DE86751586	EUR-CEA-FC—1264
DE86751587	LP—201
DE86751588	LP—199
DE86751589	CENBG—8502
DE86751590	CEA-CONF—7892
DE86751591	CEA-CONF—7954
DE86751593	FRNC-TH—2164
DE86751594	EUR-CEA-FC—1265
DE86751595	LPNHEP-T—84-01
DE86751597	CEA-CONF—7958
DE86751598	IPNO-TH—85-07
DE86751599	LAL—85-35
DE86751601	LAL—85-29
DE86751602	CEA-CONF—8034
DE86751603	CEA-CONF—8033
DE86751604	CEA-CONF—8037
DE86751605	CEA-CONF—8043
DE86751606	CEA-CONF—8079
DE86751607	EUR—9593
DE86751608	EUR—9541-Pt.1
DE86751609	EUR—9877
DE86751610	EUR—10194
DE86751611	EUR—10165
DE86751612	EUR—10115
DE86751613	EUR—9874
DE86751614	ISN—83-36
DE86751615	CSNSM-T—84-01
DE86751616	ISN—85-05
DE86751617	IPNO-DRE—85-11
DE86751618	ISN—85-30
DE86751619	IPNO-T—83-04
DE86751620	CEA-N—2428
DE86751631	Juel—2010
DE86751632	INIS-mf—9876
DE86751633	INIS-mf—9877
DE86751634	Juel—2013
DE86751635	Juel—2016
DE86751637	CEA-R—5326
DE86751638	EUR—9536
DE86751639	EUR—9379
DE86751640	EUR—9676-Vol.1
DE86751641	EUR—9862
DE86751642	EUR—9865
DE86751643	EUR—9836
DE86751645	EUR—10077
DE86751646	EUR—10213
DE86751647	EUR—9676-Vol.2
DE86751648	EUR—9875
DE86751649	KTM/E-D—89
DE86751650	KTM/E-D—90
DE86751651	TKK-KO/PM—49
DE86751653	TKK-KO/PM—47
DE86751654	TKK-KO/PM—46
DE86751655	TKK-KO/PM—44
DE86751656	TKK-KO/PM—45
DE86751657	TKK-KO/PM—41
DE86751658	ETY—1/1982
DE86751659	ETY—2/1983
DE86751660	ETY—3/1983
DE86751661	ETY—4/83
DE86751662	ETY—5/1983
DE86751663	ETY—6/1983
DE86751664	ETY—8/1983
DE86751665	ETY—7/1983
DE86751666	ETY—10/1984
DE86751667	ETY—11/1984
DE86751668	ETY—13/85
DE86751669	ETY—14/1985
DE86751670	ETY—15/85
DE86751671	VTT-TUTK—379
DE86751672	VTT-TIED—513
DE86751673	STEV-TORV—85-17
DE86751674	STEV-BF—85-8
DE86751675	STEV-FVE—85-1
DE86751676	STEV-FBA—85-15
DE86751677	STEV-VIND—85-28
DE86751678	STEV-VIND—85-25
DE86751679	STEV-VIND—85-17
DE86751680	STEV-VIND—85-15
DE86751681	SNV-PM—1997
DE86751682	BFR-R—109-1985
DE86751683	BFR-R—114-1985
DE86751684	BFR-R—117-1985
DE86751685	BFR-R—118-1985
DE86751686	STEV-BF—85-16
DE86751687	STEV-BF—86-1
DE86751688	STEV-BF—86-2
DE86751689	STEV-FVE—85-4
DE86751690	STEV-TORV—86-2
DE86751691	STEV-TORV—86-3
DE86751692	STEV-VIND—85-41
DE86751693	NP—6751693
DE86751694	NP—6751694
DE86751695	NP—6751695
DE86751696	NP—6751696
DE86751697	NP—6751697
DE86751698	NP—6751698
DE86751699	NP—6751699
DE86751700	NP—6751700
DE86751701	NP—6751701
DE86751702	NP—6751702
DE86751703	NP—6751703
DE86751704	NP—6751704
DE86751705	NP—6751705
DE86751706	NP—6751706
DE86751707	NP—6751707
DE86751708	PTB-Me—58
DE86751709	Juel-Spez—304
DE86751710	CONF-8405400—
DE86751711	NP—6751711
DE86751712	NP—6751712
DE86751713	NP—6751713
DE86751714	NP—6751714
DE86751715	NP—6751715
DE86751716	NP—6751716
DE86751717	CONF-8411253—Vol.1
DE86751718	NP—6751718
DE86751719	CONF-8502124—
DE86751720	NP—6751720
DE86751721	GKSS—85/E/29
DE86751722	IKE—2-70
DE86751723	NP—6751723
DE86751724	GRS—59
DE86751725	GSF—35/85
DE86751726	KFK—3996
DE86751869	GESC—85-9.C
DE86751870	EUR—9404
DE86751872	EUR—8906
DE86751889	GB—11
DE86751892	ETSU-R—36
DE86751893	GB—4
DE86770098	CEA-CONF—8279
DE86780434	KEK—83-12
DE86780435	KEK—83-31
DE86780436	CSIR-SR-CHEM—267
DE86780445	INIS-mf—10098
DE86780449	EUR—9673-Vol.2
DE86780450	EUR—9925
DE86780451	EUR—10074
DE86780452	EUR—10075
DE86780453	EUR—10076
DE86780454	EUR—10078
DE86780455	EUR—10079-Vol.1
DE86780456	EUR—10079-Vol.2
DE86900964	ENEA-RT/STUDI—85-1
DE86901005	ENEA-RT/PROT—83-23
DE86901131	TVA/ONRED/AWR—85/7
DE86901184	AEEW-R—423
DE86901185	CONF-860286—1
DE86901195	JUEL—1569
DE86901242	TRI-PP—86-5
DE86901243	TRI-PP—86-3
DE86901244	TRI-PP—86-2

File No.	Report No.
DE86901253	NEANDC(E)—262-U-Vol.3-EURATOM
DE86901259	CERN-EP—86-27
DE86901267	TVA/PE/EDT—85/24
DE86901268	TVA/ONRED/AWR—85/32
DE86901274	TVA/OACD—85/9
DE86901275	TVA/OP/FHP—86/3
DE86901276	TVA/OACD—85/13
DE86901287	TVA/OACD—6901287
DE86901289	TVA/OACD—85/11
DE86901302	ICTP-IC—85/284
DE86901305	NMERDI—2-73-4316
DE86901309	ICTP-IC—85/253
TI85015357	CONF-850314—Vol.2
TI86003680	LA-UR—85-3959
TI86003784	NUREG/CR—4016-Vol.1
TI86004581	NUREG/CR—4022
TI86004821	CONF-860675—1
TI86005188	NUREG/CR—4380
TI86005237	NUREG/CR—4348-Vol.1
TI86005238	NUREG/CR—4348-Vol.2
TI86005441	SAND—86-0027C
TI86006070	CONF-860415—4
TI86006671	TPR-NS—27-No.2
TI86006879	BNL-NUREG—37616
TI86006880	BNL-NUREG—37615
TI86006881	BNL-NUREG—37617
TI86006883	BNL-NUREG—37612
TI86007137	BNL-NUREG—37705
TI86007668	NUREG/CR—4557
TI86007761	NUREG/CR—4338
TI86008412	NUREG/CR—4489
TI86008422	NUREG/CR—4047
TI86008542	NUREG/CR—4332
TI86008600	NUREG/CR—3137
TI86008835	NUREG/CR—4436-Vol.2
TI86008890	DOE/OR/21400—T258
TI86008928	NUREG/CR—4449
TI86009372	NUREG/CR—4505
TI86009373	NUREG/CR—3365
TI86009423	HEDL—7467
TI86009430	BNL-NUREG—37869
TI86009493	NUREG/CR—3064-Vol.2
TI86009575	NUREG/CR—4568
TI86009596	NUREG/CR—3517
TI86009627	DOE/DP/00789—T246
TI86009678	NUREG/CR—4330-Vol.1
TI86009816	NUREG/CR—3965
TI86009861	SAND—85-1616C
TI86009876	DOE/ER—0268
TI86009909	LBL—18914
TI86009941	BNL-NUREG—37940
TI86010225	NUREG/CR—4412
TI86010247	NUREG/CR—2675-Vol.5
TI86010248	NUREG/CR—4520
TI86900380	NUREG/CR—4437
TI86900447	USGS/MAP/I—159-B
TI86901097	NYSERDA—84-8
TI86901153	RAL—85-006
TI86901173	NUREG—1168
TI86901177	AEEW-R—1925
TI86901179	NP—6901179
TI86901196	SRD-R—325
TI86901199	SRD-R—297
TI86901204	SRD-R—276
TI86901210	GAO/RCED—86-41
TI86901211	GAO/RCED—86-50
TI86901216	WAOENG—86-03
TI86901217	WAOENG—85-49
TI86901218	RAL—85-056
TI86901224	RAL—85-057
TI86901245	AEEW-R—404
TI86901252	NUREG/CR—4579
TI86901285	NP—6901285
TI86901286	AIF/NESP—034
TI86901295	AEEW-M—2234
TI86901297	IEA/ICTIS/TR—31
TI86901300	NUREG—1188
TI86901301	NUREG—0781
TI86901303	NYSERDA—85-20
TI86901343	NUREG—1192
TI86901346	NUREG—1181
TI86901353	NUREG/CP—0067-Vol.1
TI86901354	NUREG/CP—0067-Vol.2
TI86901355	NUREG—0985-Rev.2
TI86901356	NUREG—0020-Vol.10-No.3
TI86901359	IEA/ICEAS—C3
TI86920242	EPRI-NP—4478
TI86920253	EPRI-EA—4447-Vol.1
TI86920254	EPRI-EA—4447-Vol.2

AVAILABILITY OF REFERENCES ABSTRACTED

REPORTS

A document cited in this publication is considered a "report" when it carries a unique identifying number (e.g., ANL-3130, BNL-4000, DP-150, etc.) as the first element of the citation. Usually, one or more of the following abbreviations will appear at or near the end of the citation, indicating the organization from which the document is available. If none of these abbreviations appears, the report should be requested from either the cited publisher or corporate source.

GPO — Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

GPO Dep. — Available for inspection or interlibrary loan at GPO depository libraries. Unlimited DOE reports are being sent to the GPO depository libraries. See inside back cover for list of the libraries. These reports are identified by report number, Supt. of Docs. Class Number (E 1.99:) and OSTI accession/file number, e.g., DE84003384.

NTIS — For sale by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. Paper copy (PC) price codes given are for domestic users; prices for foreign purchasers are in most instances twice the domestic price. There is only one microfiche (MF) price code, MF A01 ($5.95).

OSTI — Available from the Office of Scientific and Technical Information (OSTI), U. S. Department of Energy, P. O. Box 62, Oak Ridge, TN 37831, Attn: Technical Information Division.

NOTE: DOE offices and contractors should order reports from OSTI; all others should order from NTIS. For additional information, see the introductory paragraph to the Report Number Index.

NTIS NORTH AMERICAN PRICE CODES

Most NTIS products and services are now announced by price codes and, therefore, without specific prices in NTIS journals, newsletters, and indexes.

The current dollar equivalent for each code is shown in the schedule below. Orders must list the accession number(s) and be accompanied by the total dollar amount from the current schedule.

NORTH AMERICAN CONTINENT PRICE SCHEDULE

Customers in Canada, United States, and Mexico, please use this price schedule; other addressees, write for Folder PR-360-4.

MICROFICHE		E01	$7.50	T01	$145.00
A01	$5.95	E02	10.00	T02	160.00
PAPER COPY		E03	11.00	T03	275.00
A02	9.95	E04	13.50	T04	370.00
A03	9.95	E05	15.50	T05	460.00
A04	11.95	E06	18.00	T06	535.00
A05	11.95	E07	20.50	T07	610.00
A06	16.95	E08	23.00	T08	685.00
A07	16.95	E09	25.50	T09	760.00
A08	16.95	E10	28.00	T10	835.00
A09	16.95	E11	30.50	T11	910.00
A10	22.95	E12	33.00	T12	985.00
A11	22.95	E13	35.50	T13	1,060.00
A12	22.95	E14	38.50	T14	1,135.00
A13	22.95	E15	42.00	T15	1,210.00
A14	28.95	E16	46.00	T16	1,285.00
A15	28.95	E17	50.00	T17	1,360.00
A16	28.95	E18	54.00	T18	1,435.00
A17	28.95	E19	60.00	T19	1,510.00
A18	34.95	E20	70.00	T99	*
A19	34.95	E99	*		
A20	34.95				
A21	34.95	N01	40.00		
A22	40.95	N02	40.00		
A23	40.95				
A24	40.95	*Contact NTIS for price quote.			
A25	40.95				
A99	*	PRICES EFFECTIVE OCTOBER 1, 1985			

U.S. DEPARTMENT OF COMMERCE

National Technical Information Service

5285 Port Royal Road, Springfield, Virginia 22161

NON-REPORT DOCUMENTS

BOOKS

Most books cited are available from commercial publishers. Order from the publisher or other source as given, not from OSTI.

CONFERENCE PAPERS

Individual conference papers (or preprints) not available as reports should be requested from the originator or other source as cited.

CONFERENCE PROCEEDINGS

Many proceedings are available from commercial publishers; in other cases, request from the society, organization, institution, etc., cited as the source.

DISSERTATIONS (THESES)

Available from University Microfilms International, Dissertation Copies, P. O. Box 1764, Ann Arbor, MI 48106. Request by order number cited, e.g., 85-22,350.

JOURNAL ARTICLES

Users must use their own resources to obtain (or scan) articles cited—local, state, or university libraries or publishers, reprint services, etc.

MONOGRAPHS

Request from the organization, institution, society, etc., responsible for the monograph.

PATENTS

Although not cataloged as reports, patents cited from each country are listed in the Report Number Index under PATENTS-AU, PATENTS-FR, PATENTS-US, etc. U. S. Patent Applications (e.g., A 293,415) are available from NTIS.

CODES USED ON INDEX LINES

Following the citation numbers in the Corporate Author, Personal Author, and Subject Indexes, codes are used to designate the type of document, country of publication, and language of the document, e.g., (R;SU;RU). The language designator does not appear if the document is published in English.

DOCUMENT TYPES

J	Journal article
TJ	Translation of a journal article
R	Report
RA	Report analytic
B	Book
BA	Book analytic
P	Patent
E	Engineering materials
D	Dissertation
TG	Translation (general)
TA	Translation (analytic)

COUNTRY CODES

AD	Andorra
AE	United Arab Emirates
AF	Afghanistan
AL	Albania
AR	Argentina
AT	Austria
AU	Australia
BB	Barbados
BD	Bangladesh
BE	Belgium
BG	Bulgaria
BH	Bahrain
BI	Burundi
BJ	Benin
BM	Bermuda
BO	Bolivia
BR	Brazil
BS	Bahamas
BT	Bhutan
BU	Burma
BW	Botswana
BY	Byelorussian Soviet Socialist Republic (Byelorussian SSR)
CA	Canada
CB	Khmer Republic
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Ivory Coast
CL	Chile
CM	United Republic of Cameroon
CN	China
CO	Colombia
CR	Costa Rica
CS	Czechoslovakia
CU	Cuba
CY	Cyprus
DD	German Democratic Republic
DE	Germany, Federal Republic of (F.R. Germany)
DK	Denmark
DO	Dominican Republic
DZ	Algeria
EC	Ecuador
EG	Egypt
ES	Spain
ET	Ethiopia
FI	Finland
FJ	Fiji
FR	France
GA	Gabon
GB	United Kingdom of Great Britain and Northern Ireland (UK)
GD	Grenada
GH	Ghana
GM	Gambia
GN	Guinea
GQ	Equatorial Guinea
GR	Greece
GT	Guatemala
GU	Guam
GW	Guinea-Bissau
GY	Guyana
HK	Hong Kong
HN	Honduras
HT	Haiti
HU	Hungary
HV	Upper Volta
ID	Indonesia
IE	Ireland
IL	Israel
IN	India
IQ	Iraq
IR	Iran
IS	Iceland
IT	Italy
JM	Jamaica
JO	Jordan
JP	Japan
KE	Kenya
KH	Democratic Kampuchea
KP	Democratic People's Republic of Korea
KR	Korea, Republic of
KW	Kuwait
LA	Laos
LB	Lebanon
LI	Liechtenstein
LK	Sri Lanka
LR	Liberia
LS	Lesotho
LU	Luxembourg
LY	Libyan Arab Republic
MA	Morocco
MC	Monaco
MG	Madagascar
ML	Mali
MN	Mongolia
MR	Mauritania
MT	Malta

MU	Mauritius
MV	Maldives
MW	Malawi
MX	Mexico
MY	Malaysia
NE	Niger
NG	Nigeria
NI	Nicaragua
NL	Netherlands
NO	Norway
NP	Nepal
NR	Nauru
NZ	New Zealand
OM	Oman
PA	Panama
PE	Peru
PG	Papua New Guinea
PH	Philippines
PK	Pakistan
PL	Poland
PR	Puerto Rico
PT	Portugal
PY	Paraguay
QA	Qatar
RH	Southern Rhodesia
RO	Romania
RW	Rwanda
SA	Saudi Arabia
SD	Sudan
SE	Sweden
SG	Singapore
SK	Sikkim
SL	Sierra Leone
SM	San Marino
SN	Senegal
SO	Somalia
SU	Union of Soviet Socialist Republics (USSR)
SV	El Salvador
SY	Syria
SZ	Swaziland
TD	Chad
TG	Togo
TH	Thailand
TN	Tunisia
TO	Tonga
TR	Turkey
TT	Trinidad and Tobago
TW	Taiwan
TZ	United Republic of Tanzania
UA	Ukrainian Soviet Socialist Republic (Ukrainian SSR)
UG	Uganda
US	United States of America (USA)
UY	Uruguay
VA	Holy See
VE	Venezuela
VI	Virgin Islands of the United States
VN	Viet Nam
WS	Western Samoa
YD	Democratic Yemen
YE	Yemen
YU	Yugoslavia
ZA	South Africa
ZM	Zambia
ZR	Zaire
ZW	Zimbabwe

LANGUAGE CODES

BE	Belorussian
BU	Bulgarian
CH	Chinese
CZ	Czech
DA	Danish
DU	Dutch
FI	Finnish
FR	French
GE	German
HU	Hungarian
IR	Iranian
IT	Italian
JA	Japanese
KO	Korean
NO	Norwegian
PO	Polish
PT	Portuguese
RN	Rumanian
RU	Russian
SC	Serbo-Croatian
SE	Slovene
SP	Spanish
SV	Slovak
SW	Swedish
TH	Thai
TU	Turkish
UK	Ukrainian

CUT OUT APPROPRIATE FORM AND MAIL IN A STAMPED ENVELOPE TO THE ADDRESS INDICATED.

Change of Address Form

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

PLEASE PRINT OR TYPE

(or) COUNTRY

MAIL THIS FORM TO:

NEW ADDRESS
Superintendent of Documents
Government Printing Office SSOM
Washington, D.C. 20402

Attach last subscription label here.

Subscription Order Form

Enter my Subscription to: _____

(Please indicate publication)

@ $_____ Domestic; @ $_____ Foreign.

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

PLEASE PRINT OR TYPE

(or) COUNTRY

☐ Remittance Enclosed (Make checks payable to Superintendent of Documents)

☐ Charge to my Deposit Account No._____

MAIL ORDER FORM TO:
Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

ATMOSPHERIC SCIENCE AND POWER PRODUCTION

Darryl Randerson, Editor

Weather Service Nuclear Support Office

National Oceanic and Atmospheric Administration

U. S. Department of Commerce

Prepared for the Office of Energy Research, Office of Health and Environmental Research, U. S. Department of Energy

Published by the Office of Scientific and Technical Information, U. S. Department of Energy, 1984
850 pages, 8½ × 11 inches, hardbound

Available as DE84005177 (DOE/TIC-27601) for $29.50 from
National Technical Information Service
U. S. Department of Commerce
Springfield, Virginia 22161

DOE and DOE contractor offices with an official use for this book should contact Request Services, Technical Information Division, USDOE Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831.

Atmospheric Science and Power Production is the third publication in a series of scientific publications sponsored by the U. S. Atomic Energy Commission and its predecessor agencies, the U. S. Energy Research and Development Administration and the U. S. Department of Energy. The first book, *Meteorology and Atomic Energy*, was published in 1955; the second, *Meteorology and Atomic Energy—1968*, in 1968. The present edition is designed to update and to expand on many of the important concepts presented previously, but it draws heavily on recent contributions made by atmospheric science to the analysis of air quality and on results originating from research conducted and completed in the 1970s. Special emphasis is placed on the contribution of atmospheric science to solving problems related to the fate of combustion products released into the atmosphere.

The framework of this book is the concept of air-quality modeling. Fundamentals are addressed first to equip the reader with basic background information, to focus on available meteorological instrumentation, and to emphasize the importance of data management procedures. Atmospheric physics and field experiments are described in detail to provide an overview of atmospheric boundary layer processes, of how air flows around obstacles, and of the mechanism of plume rise. Atmospheric chemistry and removal processes are also detailed to provide fundamental knowledge on how gases and particulate matter can be transformed while in the atmosphere and how they can be removed from the atmosphere. The book concludes with a review of the application of air-quality models to a wide variety of problems.

Like its predecessors, this book can be used by university professors and students as a textbook, by professional workers in various disciplines related to power production and air-quality analysis as a handbook, and by readers requiring a general knowledge of the factors relating to the power production industry as an introductory guide to the concepts and terminology used by atmospheric scientists, health physicists, and those responsible for regulating air quality.

FEDERAL DEPOSITORY LIBRARY PROGRAM

As a result of an agreement between the U. S. Government Printing Office (GPO) and the Department of Energy, beginning in 1984 DOE reports with unlimited distribution are now included in the Federal Depository Library Program. The Regional Depository Libraries listed below receive and retain at least one copy of nearly every Federal Government publication, either in printed or microfilm form, for use by the general public. These libraries provide reference services and interlibrary loans; however, they are *not* sales outlets. You may wish to ask your local library to contact a Regional Depository to help you locate specific publications, or you may contact the Regional Depository yourself. Do not send checks or orders to these libraries.

ARKANSAS STATE LIBRARY
One Capitol Mall
Little Rock, AR 72201
(501) 371-2326

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Department
Montgomery, AL 36193
(205) 279-9110, ext. 253

UNIV. OF ALABAMA LIBRARY
Documents Dept.-Box S
University, AL 35486
(205) 348-7369

DEPT. OF LIBRARY, ARCHIVES AND PUBLIC RECORDS
Third Floor-State Cap.
1700 West Washington
Phoenix, AZ 85007
(602) 255-4121

UNIVERSITY OF ARIZONA LIB.
Governments Documents Dept.
Tucson, AZ 85721
(602) 626-5233

CALIFORNIA STATE LIBRARY
Govt. Publications Section
P.O. Box 2037
Sacramento, CA 95809
(916) 322-4572

UNIV. OF COLORADO LIB.
Government Pub. Division
Campus Box 184
Boulder, CO 80309
(303) 492-8834

DENVER PUBLIC LIBRARY
Govt. Pub. Department
1357 Broadway
Denver, CO 80203
(303) 571-2131

CONNECTICUT STATE LIBRARY
Government Documents Unit
231 Capitol Avenue
Hartford, CT 06106
(203) 566-4971

UNIV. OF FLORIDA LIBRARIES
Library West
Documents Department
Gainesville, FL 32611
(904) 392-0367

UNIV. OF GEORGIA LIBRARIES
Government Reference Dept.
Athens, GA 30602
(404) 542-8951

UNIV. OF HAWAII LIBRARY
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948-8230

UNIV. OF IDAHO LIBRARY
Documents Section
Moscow, ID 83843
(208) 885-6344

ILLINOIS STATE LIBRARY
Information Services Branch
Centennial Building
Springfield, IL 62706
(217) 782-5185

INDIANA STATE LIBRARY
Serials Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3686

UNIV. OF IOWA LIBRARIES
Govt. Documents Department
Iowa City, IA 52242
(319) 353-3318

UNIVERSITY OF KANSAS
Doc. Collect.-Spencer Lib.
Lawrence, KS 66045
(913) 864-4662

UNIV. OF KENTUCKY LIBRARIES
Govt. Pub. Department
Lexington, KY 40506
(606) 257-3139

LOUISIANA STATE UNIVERSITY
Middleton Library
Govt. Docs. Dept.
Baton Rouge, LA 70803
(504) 388-2570

LOUISIANA TECHNICAL UNIV. LIBRARY
Documents Department
Ruston, LA 71272
(318) 257-4962

UNIVERSITY OF MAINE
Raymond H. Fogler Library
Tri-State Regional Documents Depository
Orono, ME 04469
(207) 581-1680

UNIVERSITY OF MARYLAND
McKeldin Lib.-Doc. Div.
College Park, MD 20742
(301) 454-3034

BOSTON PUBLIC LIBRARY
Government Docs. Dept.
Boston, MA 02117
(617) 536-5400 ext. 226

DETROIT PUBLIC LIBRARY
Sociology Department
5201 Woodward Avenue
Detroit, MI 48202
(313) 833-1409

MICHIGAN STATE LIBRARY
P.O. Box 30007
Lansing, MI 48909
(517) 373-0640

UNIVERSITY OF MINNESOTA
Government Pubs. Division
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 373-7813

UNIV. OF MISSISSIPPI LIB.
Documents Department
University, MS 38677
(601) 232-5857

UNIV. OF MONTANA
Mansfield Library
Documents Division
Missoula, MT 59812
(406) 243-6700

NEBRASKA LIBRARY COMM.
Federal Documents
1420 P Street
Lincoln, NE 68508
(402) 471-2045
(in cooperation with University of Nebraska-Lincoln)

UNIVERSITY OF NEVADA LIB.
Govt. Pub. Department
Reno, NV 89557
(702) 784-6579

NEWARK PUBLIC LIBRARY
5 Washington Street
Newark, NJ 07101
(201) 733-7812

UNIVERSITY OF NEW MEXICO
Zimmerman Library
Government Pub. Dept.
Albuquerque, NM 87131
(505) 277-5441

NEW MEXICO STATE LIBRARY
Reference Department
325 Don Gaspar Avenue
Santa Fe, NM 87501
(505) 827-2033, ext. 22

NEW YORK STATE LIBRARY
Empire State Plaza
Albany, NY 12230
(518) 474-5563

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
Wilson Library
BA/SS Documents Division
Chapel Hill, NC 27515
(919) 962-1321

UNIVERSITY OF NORTH DAKOTA
Chester Fritz Library
Documents Department
Grand Forks, ND 58202
(701) 777-2617, ext. 27
(in cooperation with North Dakota State Univ. Library)

STATE LIBRARY OF OHIO
Documents Department
65 South Front Street
Columbus, OH 43215
(614) 462-7051

OKLAHOMA DEPT. OF LIBRARIES
Government Documents
200 NE 18th Street
Oklahoma City, OK 73105
(405) 521-2502

OKLAHOMA STATE UNIV. LIB.
Documents Department
Stillwater, OK 74078
(405) 624-6546

PORTLAND STATE UNIV. LIB.
Documents Department
P.O. Box 1151
Portland, OR 97207
(503) 229-3673

STATE LIBRARY OF PENN.
Government Pub. Section
P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

TEXAS STATE LIBRARY
Public Services Department
P.O. Box 12927-Cap. Sta.
Austin, TX 78753
(512) 471-2996

TEXAS TECH. UNIV. LIBRARY
Govt. Documents Department
Lubbock, TX 79409
(806) 742-2268

UTAH STATE UNIVERSITY
Merrill Library, U.M.C. 30
Logan, UT 84322
(801) 750-2682

UNIVERSITY OF VIRGINIA
Alderman Lib.-Public Doc.
Charlottesville, VA 22901
(804) 924-3133

WASHINGTON STATE LIBRARY
Documents Section
Olympia, WA 98504
(206) 753-4027

WEST VIRGINIA UNIV. LIB.
Documents Department
Morgantown, WV 26506
(304) 293-3640

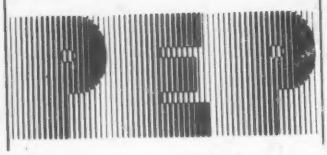
MILWAUKEE PUBLIC LIBRARY
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-3000

ST. HIST. LIB. OF WISCONSIN
Government Pub. Section
816 State Street
Madison, WI 53706
(608) 262-4347

WYOMING STATE LIBRARY
Supreme Ct. & Library Bld.
Cheyenne, WY 82002
(307) 777-6344

PERSONAL ENERGY PROFILE (PEP)

COMPUTER SEARCH SERVICE



PEP is a customized computer search service provided to DOE and contractor personnel on DOE/RECON (the Department's interactive on-line information retrieval system). For others, these selective dissemination-of-information services are available on commercial on-line systems. PEP automatically supplies the latest information in your field of interest by searching any of the regularly updated data bases in DOE/RECON twice a month, printing out the new bibliographic entries defined by your particular search, and mailing the update to you.

A search strategy is custom designed for each PEP subscriber so that each person's unique information needs are met. Your library and the scientific specialists at the Office of Scientific and Technical Information work with you to design a suitable search. Once the PEP service has been established, the search is automatically executed twice a month, and the results—provided in computer printout form—are mailed to you.

To obtain additional information about the specifics of subscribing to the PEP search service, or for examples of PEP search results, contact the library at your facility. If you do not have a library at your facility, contact

Technical Information Division
Office of Scientific and
Technical Information
U. S. Department of Energy
P. O. Box 62
Oak Ridge, TN 37831